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Journal of the Inventors' Institute.

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SCIENTIFIC REVIEW
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ARTS, INDUSTRY, AND MANUFACTURES,
INCORPORATING THE
JOURNAL OF THE INVENTORS' INSTITUTE.

DECEMBER 1, 1876.

EDUCATION AND SCHOOL BOARDISM.

On the same day that this issues from the press our Great Metropolis again elects a School Board—the second election in six years—therefore the present may be deemed an opportune moment to direct public attention to the true and the false notions which attach to the term Education.

At first sight the term education seems to have reference to a matter so well understood that a disquisition on it would appear to be mere waste of time, but further consideration will show that a true idea of what is meant by the word is worthy of deep and earnest consideration. Most people consider Instruction and Education as synonymous, and, by confounding the two terms, are led into many erroneous courses in respect to them. Now, the term Education, to follow its etymology, relates to such treatment of living beings as shall bring out their capabilities in the fullest and most advantageous manner; whilst Instruction has reference simply to imparting Information. Education necessitates instruction, but is something larger and more important.

It is clear that the human faculties will have little chance of being brought into useful form without instruction in rudimentary knowledge such as is commonly spoken of as the three R's—reading, writing, and arithmetic—for these are the stepping stones to knowledge; further the true education of everyone will be forwarded by such other instruction of a more advanced character, as may be suitable to character and bent of mind; that is, the genius of the scholar and his future position in life should be kept in view, so that as much real and useful education may be secured as the case will admit of; but the most persistent course of instruction in matters not concurrent with the character and capacity of the individual will, in all probability, prove to be mere waste of time, except as a cramming process, to enable an examination to be passed through with success, with the ultimate result of all being forgotten a few years after.

In these days everybody is an advocate of education, and to attain this we have School Boards nearly everywhere; but, unfortunately, the real question has been to a great extent thrown into the background by the squabbles of religious sectaries, who are so very jealous of each other, that they think any subject which is likely to lead to the advancement of views of religion differing from their own should be carefully excluded from the school curriculum; and this has by some been carried so far, as in the course adopted at Birmingham, as to altogether exclude subjects of this kind from the Board Schools, except by allowing volunteers to come into such schools and teach the same each after his own fashion, a plan which has certainly the merit of enabling every denomination to get a fair chance of forwarding its own peculiar tenets, but is the very best possible way of perpetuating sectarianism amongst our people, since they will by this system get no notions of religion except they come through the teachers of a particular sect, and this will by-and-bye place such of the rising generation as have been kept from receiving any religious instruction whatever, entirely at the mercy of the dogmatic teaching of the priest or parson who may happen to fall in with them. To the credit of London a wiser course has been adopted, the Bible with mere general explanations being used, by which plan information as to the main points of the religion current in the country is disseminated, whilst all that is simply denominational finds no place in school teaching—a course very likely to promote eclectic views of religious questions.

As far as regards the School Board system, it ought to be kept in view that it is its special object to provide schools for teaching the mere elements of knowledge, and to ensure that all children are under elementary instruction, but the high-handed way in which the system is too often worked, leads one to fear that a strong feeling exists amongst Board School members that their schools, or such as may be upon their model, ought to be the only means of education, in fact, that the procrustean plan is the right one, whereas competition where not excessive is good in education as in everything else.

What the country needs is first to have every child well instructed in the simple elementary subjects, and further, that such children as may shew themselves to be worthy of higher instruction be enabled to receive it not perhaps by means of public rates and taxes, but by the use of those magnificent endowments which the philanthropy and piety of our ancesters have left for our benefit. Such instruction to consist in the great majority of cases in imparting sound information, not in classics and literature, though these may suit some minds, but in science having regard to its practical and applicative aspects; in fact it should be a system of what is called Technical Education, or rather education in science so far as it is useful in the arts, and not in regard to its higher and abstract forms, though for some scholars even this would be desirable, and it will do nothing for the prosperity of this country to destroy the individuality of Englishmen by educating them all to order to the discouragement that originality of mind which produces the action of the inventive faculties.

Reviews.

TOLHAUSEN'S TECHNOLOGICAL DICTIONARY.

"Technologisches Wörterbuch in Französischer. Deutscher und Englischer Sprache. Von Alexander Tolhausen. 3 Parts (Leipzig, Tauchnitz).

This is a work of great labour and great utility, equally for Germans, Frenchmen, and English. Ninety thousand technical terms and phrases are given in three languages. In the first part (one volume), the order of words is French, German, English; in the second, English, German, French; in the third, German, English French. In point of fact this work, which it is stated represents the labour of twenty years, will be found of immense benefit to industrial progress, which it is now evident largely depends on the great civilised nations being *au courant* with such others, and Dr. Tolhausen, the compiler (translator in our Patent Office), and Herr Louis Tolhausen, of Leipzig, who has revised the work, deserve great credit.

"British Manufacturing Industries: Shipbuilding." By Capt. Bedford Pim, R.N., M.P. "Telegraphy." By Robert Sabine, C.E. "Agricultural Machinery." By Prof. Wrightson. "Railways and Tramways." By D. Kinnear Clark, C.E. (Stanford.)

These works form worthy additions to our text books of practical science; but as regards Capt. Bedford Pim's, we must say that the attacks on the Moorsom system of measurement and our dockyard management, though possibly justifiable, seem out of place in a book of this kind, in which only the merest incidental notice of the author's opinions are allowable.

Serial Edition of Dr. Farrar's Life of Christ, publishing by Messrs. Cassell Peter and Galpin. It is needless for us to do more than notice this new enterprise of Messrs. Cassell's, and remark that the style of typography, the illustrations, and all connected with the work appear from the first number, the only one we have seen, to be eminently satisfactory.

Review Postponed.—"Dr. R. H. Collyer on Automatic Writing, with Defence of Slade." We have not room to give a full review of this very interesting book, which everyone should read before pronouncing judgment in the Slade case.

THE DATCHELOR SCHOOL, CAMBERWELL.

Camberwell is about to receive the benefit of a legacy left many years ago by an old lady named Mary Datchelor, who bequeathed money for the purpose of keeping in repair her vault and monument in the church of St. Andrew Undershaft, in the City, and also for educating the children of persons residing in or connected with the parish of St. Andrew. In consequence of there having been few children to educate during many years past, owing to the removal of families from the several parishes in the city, the accumulated funds of the charity now amount to £30,000. The trustees, having found that these funds could not be turned to any useful purpose under the powers which they possessed, applied to the Charity Commissioners to prepare a new scheme for establishing schools to educate girls belonging to the middle class. The Charity Commissioners have accordingly drawn up a scheme under which an endowed school is to be built in Camberwell for the education of 350 girls. The daughters of persons of the midle class resident in or habitually employed in the parish of St. Andrew Undershaft are to have priority, and after them the daughters of the public generally of the same class from any locality. The new schools are to be erected on a site which the trustees under the charity have purchased between Camberwell Grove and Grove Lane, near St. Giles's parish church, and as the sum of £30,000 is at the disposal of the trustees they intend to erect a building of some architectural character, besides endowing the school. Provision has not been forgotten in the scheme for keeping the founder's vault and monument in St. Andrew's church in repair.

SONNET.

We walked in thy fair garden one sweet eve,
    And talked of Sappho and the sons of song;
    And thou, in thy full heart, didst listen long
To words, which only kindred spirits weave—
Who love to linger, and who sigh to leave:
    E'en as the pale moonlight, which shone among
    The whisp'ring trees from which the dew drops hung
Like glit'ning tears, we thought, they seemed to grieve!
    Whilst in surpassing loveliness thy face,
Lit with her light, seemed like an angel's there,
    Borne to the earth from some diviner place!
And as I watched thy lustrous eyes so rare,
    And form, the offspring of a noble race,
Methought, how sweet, a soul like thine to share.

Henry George Hellon.

AMERICAN INVENTIONS.

Hay Elevator and Carrier.—Joshua Anderson, Short Creek, Ohio.—This invention consists in the construction of the carriage and its arrangement to the track or way upon which it runs, the same being so constructed and arranged that the elevation of the load of hay in the fork trips the carriage and allows it to move upon the ways, and the load is held in its position near the carriage by a retaining device independently of the draft rope, so that it cannot sway to the floor again when the carriage is set free.

Composition for Artificial Marble.—Louis De Planque, New York City, assignor to himself and Francis Strom, same place.—The composition consists of plaster of Paris dissolved in whey, under admixture of starch, glue, and sulphate of zinc. The mass is cast and pressed into moulds, in which it remains a few hours until completely hardened. It is taken out of the moulds when hard and polished. Any imitation of marble or other stone may thus be produced.

A NEW DECORATIVE MATERIAL.

Mr. Fredk. I. Barff, the well-known professor of chemistry at the Royal Academy of Arts, has been calling attention for several years past to the injurious effects of white lead upon the health of all who are in any way exposed to its influence. In a recent letter to the *Times*, referring to Mr. Redgrave's report on this subject, he says, "I have been for a long time engaged on the investigation of paints. House painters suffer very much from lead poisoning in its various degrees of intensity; and it is almost impossible to make them see the need of cleanliness and of taking other very necessary precautions. Sooner or later white lead must be given up as a pigment, from its power of saponifying with oil, involving the loss of carbonic acid, it loses its opacity and turns yellowish. It is valued for what is termed its body, and from the ease with which it is laid on. In my lectures for several years past, at the Royal Academy of Arts, I have pointed out its defects with, I am glad to say, some success, and many artists are now using zinc white, which retains its opacity and does not blacken on exposure to foul air. For artistic purposes, zinc white can be prepared nearly equal in body to white lead. For more than a year I have been working on zinc pigments, with a view to their being used in lieu of white lead in house painting, and I feel convinced, from the results of my experiments, that zinc, properly prepared, can be made to have as good covering properties as white lead. I wish, therefore, to call the attention of those interested in this question to the fact that they can obtain a better paint in all respects than white lead, *and one which has no injurious effects on the health of those who prepare or use it.*"

We have recently seen (says our esteemed contemporary, the *Architect*) at the London offices of the Liverpool Silicate Paint Co., 107, Cannon-street, E.C., samples of various styles of decoration recommended for drawing-rooms, dining-rooms, morning-rooms, and corridors, carried out entirely without the use of either lead paint or wall paper. The paint employed is that to which Professor Barff refers in the letter from which the above quotation is taken. The effect on the walls is singularly pleasing and effective. The skirting of one of the rooms is done in enamel paint, and is surmounted by a dado of a highly ornamental character, flatted in such a manner as to produce the appearance of wall paper. The upper part of the wall is washed with a waterproof silicate solution of a neutral tint, and the ceiling, cornices, &c., are done in the new zinc white. The result is excellent, and the whole of the walls and ceiling may be washed at frequent intervals, and even disinfectant fluid of any description may be employed for cleansing either the walls or ceiling without the slightest fear of injuring or discolouring the decorative work. The public have been invited to visit and inspect the offices to which we have referred, and among the large number who have accepted the invitation was a gentleman living at Wimbledon, who has recently had some members of his family suffering from typhoid fever. After their recovery he gave instructions for the whole of the paper to be stripped from the walls of his house, and in one room he discovered that not less than twenty-five wall papers had been pasted on, one over the other, until a thickness of nearly an inch of paper and decomposed paste had accumulated. We have tried to imagine the amount of offensive effluvia that must have been constantly given off from such a mass of decaying substance, and probably many of the papers had been coloured with pigments brightened by arsenic or other dangerous ingredients. The drains of the house, to which we have referred, appear to have been well trapped, but the owner states that a very offensive odour was generally observable, which, it is now found, arose entirely from the decaying paste and paper, some portion of which had probably been hanging on the walls for more than half a century. He has now given instructions for the whole of the walls and ceilings to be covered with the various silicate or zinc-white preparations, and in consequence the walls and ceilings may in future be washed and cleansed as regularly as the flooring. The same plan has been adopted in the fever wards of one of the smaller hospitals in the North of England, and it is found that strong disinfectants may be used for cleansing the walls and ceilings without the slightest injury to the paint. We are somewhat surprised that the governing bodies of the large hospitals in the metropolis have not adopted the system. It cannot have been properly brought before their notice, for no class of men are more ready to adopt any real sanitary improvement than the governors of our metropolitan hospitals. It would also be desirable that our School Boards should turn their attention to the subject, for the importance of keeping the walls and ceilings of large school-rooms well cleansed cannot be overestimated. The expense is less than that of ordinary white-lead paint, and, taking into consideration the length of time the new preparation remains in good condition, much less than the cost of expensive wall paper. It has the further advantage that each room may be decorated with the architect's own designs, which would, of course, be appropriate to the purpose for which the room was intended. The offices in Cannon-street are still open to the inspection of the public daily, and are well worth a visit.

NOVEL LIGHTHOUSE LIGHTS.

MR. J. N. DOUGLASS, reporting in the Journal of the Society of Arts on Lighthouses and Lighthouse Apparatus at the Loan Collection of Scientific Instruments at South Kensington, refers in the following terms to the lights of rock lighthouses, especially the Little Basses Lights :—

A light of a novel and very distinctive character has been adopted for this lighthouse (the Little Basses). It belongs to a class of lights called "group flashing," which have for some time received the attention of the Trinity House. The system consists in giving two or more flashes in quick succession at intervals of (say) quarter, half, or one minute intervals, instead of a single flash at the same intervals. The first light established on this system was a floating catoptric light at the Royal Sovereign Shoal, near Beachy Head. This light gives three flashes in quick succession at intervals of one minute ; and it has been found to be very distinctive and efficient. The first order dioptric light for the Little Basses has been designed by Dr. Hopkinson, and manufactured by Messrs. Chance Bros. and Co. It is intended to give two flashes in quick succession at intervals of one minute. This is accomplished by cutting away a portion from the opposite side of each pair of lenses, so as to bring their axes closer together, and to the required angle in azimuth for the short eclipse between the flashes. The maximum intensity of this light with a six-wick improved lamp in focus, is about 88,900 candles, being about 1,234 times the intensity of the beam originally emitted from the Eddystone. There is at the Trinity House one of the first lenses used in an English lighthouse, this was at the Portland Lower Light in 1786, being thirty-three years before the invention by that eminent Frenchman, Augustin Fresnel, of his lenticular lighthouse system. In 1836, at the Start Point Lighthouse, on the coast of South Devon, the Trinity House installed the first dioptric apparatus on Fresnel's system in an English lighthouse. One of these lenses was in the Exhibition. There were eight lenses to the circle, with fixed silvered mirrors above them. The intensity of the flashes of this light, with its concentric four-wick lamp, was about 49,392 candles. This apparatus was manufactured by Messrs. Cookson and Co., of Newcastle-on-Tyne. It is exceedingly interesting and instructive to compare the imperfect material and workmanship of these instruments with the excellent apparatus now manufactured. The illuminating apparatus at the Start Lighthouse, and that of the South Stack Lighthouse, near Holyhead, have lately been replaced by dioptric apparatus, having six lenses to the circle; these apparatus have been manufactured by Messrs. Chance Bros. and Co. The intensity of their flashes, with their six-wick lamp in focus, is about 169,360 candles, or about twice the power of the light for the Little Basses. These two lights are at present the most powerful oil lights in the world.

Before concluding, it may be well to make a few remarks on the two other sources of lighthouse illumination adopted, viz., coal gas and the electric light. The latter we owe to the discovery of Faraday, and the ingenuity and inventive genius of Holmes. Neither of these illuminants is applicable to the class of lighthouses which are the subjects of our paper, owing to the want of space for the requisite apparatus and fuel. Both systems are, however, on their trial in this country, and at present their extra cost appears to be the only barrier to their more general adoption for shore stations.

At the Haisboro' lighthouses, on the coast of Norfolk, coal gas on the system of Mr. Wigham, of Dublin, has been under trial about four years, with satisfactory results. Several of these lights have been established on the coast of Ireland by the Commissioners of Irish Lights.

The electric light has been under trial in this country nearly eighteen years. It was first tried at the South Foreland Lighthouse in 1858. There are now two electric fixed lights at the South Foreland, and an electric revolving light has been exhibited at the Souter Point Lighthouse on the coast of Durham, for the last five and a half years. The flash of this light has an intensity of about 392,000 candles, or about two and a quarter times the intensity of the oil lamps at the Start and South Stack. With the improved electric machines of Gramme or Siemens, which were to be seen at the Loan Exhibition, this enormous intensity of light would probably be increased five to six times ; indeed, there appears to be no practical limit to the power available for the service of the mariner by this marvellous source of illumination.

Unfortunately, such fogs occasionally occur as to eclipse even the sun ; consequently the most powerful artificial light must be unable to cope with them. Recent investigations of the Trinity House, aided by their scientific adviser, Dr. Tyndall, whose researches on fog are so well known, are leading to the development of powerful sound signals as aids to the mariner at such times as light is no longer serviceable. Some of these instruments were shown by the Trinity House, in the Lighthouse Section of the Loan Exhibition.

BLOCK TELEGRAPHS FOR SINGLE LINES OF RAILWAY.

THE want of an indicator in connection with the block instruments of single lines has been long felt, such as would enable the signalman to see at once the correct position of the train, either on the section or clear of it. To meet this requirement, the following apparatus has been devised by Mr. Harper. There is a locking plate on the front of the block instrument, which alternately locks one or the other of the plungers for raising or lowering the minature semaphore arms on the dial face of the instrument ; under the locking plate is fitted a screen piece with the words "Train on line" engraved on it, which is brought in and out of action as follows :—For giving permission for a train to approach, the locking plate must be raised before the bottom plunger can be depressed ; this plate, by a stud connection, raises the screen piece also, but upon restoring the locking plate back to its normal position, the screen piece is left behind, showing the words "Train on line" while the train is approaching. Upon the arrival of the train, the screen piece is turned by the singalman behind the locking plate by a button, the screen at the same time uncovering a fixed engraved face with the words "Train clear." By this means the signalman is always able at a glance to ascertain the state of the section of line he has to deal with. The instruments by another arrangement are also interlocked with each other, so that in the event of permission being obtained for a train, it cannot be given for a meeting train, showing that such collisions as that at Radstock are easily preventable. In connection with the block telegraphs mentioned, is an apparatus for controlling the position of the out-door semaphore. A compound lever, actuated by an electro-magnet, serves to connect or disconnect the hand lever of the out-door signal, so that in the event of the block instruments being at the position of danger, the hand lever has no control over the semaphore. Should the block instrument and the semaphore be at clear, and the hand lever have control of the semaphore, the signalman at the distant station would place the semaphore to danger by merely pressing the plunger of the "Train on line" portion of the instrument.—*From the "Journal of the Society of Arts."*

THE ARCTIC EXPEDITION.

CAPTAIN NARES has presented narratives of his operations to the Admiralty, from which we gather the following particulars:—

THE MIDDLE ICE.—Capt. Nares took the middle passage through Baffin's Bay, instead of, as is usual with the whalers, crossing the ice-encumbered Melville Bay but he would not recommend this course to be adopted in every case. The middle ice is dreaded by navigators, and not without good reason.

PORT FOULKE.—This locality, on the Greenland shore of Smith's Sound, was the winter quarters of Dr. Hayes. He considered it an admirable wintering station, an opinion in which Capt. Nares coincides. "A warm ocean current, combined with the prevailing northerly winds, acting at the narrow entrance of Smith Sound, keeps the ice constantly breaking away during the winter, causes an early spring, and a prolific seal and walrus fishery. The moisture and warmth imparted to the atmosphere by the uncovered water moderates the seasons to such an extent that the land is more richly vegetated, and therefore attracts to the neighbourhood and supports Arctic life in greater abundance than other less favoured localities. In addition to this great advantage—of obtaining an abundant supply of fresh meat, connected as its waters are with the 'north water' off Cape York, it can readily be communicated with every summer without more than the usual risks attending Arctic navigation." Indeed, Capt. Allen Young and the whaler Erik visited these once unfamiliar localities this summer without experiencing any great difficulties. Still, in our opinion, Capt. Nares has not solved the problem of Port Foulke and its neighbourhood being so mild in climate while regions only a little to the north were found to be sterile. That Kane starved at Rensselaer Harbour twenty miles to the northward, while Hall found Thank God Bay, still further north—nearly two hundred miles further—mild, and even pleasant, comparatively speaking, can only be accounted for by the variation of the seasons, or by the west coast of Smith's Sound being more inclement than the east. Indeed, the ice is much longer in breaking off from the western shores of Davis Strait and Baffin's Bay than from the eastern or Greenland side.

BAD CHARTS OF SMITH'S SOUND.—Capt. Nares complains that Kane's and Hayes's charts were of little use to him, being most erroneous. "The two islands marked on the chart, on the authority of Dr. Hayes, as existing at the entrance of Hayes Sound, are, as originally represented by the present Admiral Inglefield, in reality, joined; the three capes named by the latter, north of Cape Sabine, are very prominent headlands, and readily sighted from a ship's deck from any position north of Littleton Island. There is no sign of an inlet along the very slightly indented cost line between his Cape Camperdown and Cape Albert. His Princess

Marie Bay is the inlet north of the land in the middle of the sound; but whether that be an island or a peninsula, remains to be determined; and his Cape Victoria is evidently one of the headlands on the present Grinnell Land." It is as yet uncertain whether Hayes Sound is a channel or not, though the probabilities are that it is an inlet leading to a western sea. Capt. Nares also animadverts on the bad taste of Drs. Kane and Hayes in altering, on insufficient grounds, the names of points given by Admiral Inglefield—strictures which will, no doubt, bring down on the devoted head of the commander of our Arctic Expedition Dr. Hayes and all the horse, foot, and dragoons of American geography, more especially as, while acknowledging the deceptive character of the Arctic atmosphere, he removes President Land from the chart without having absolutely reached the locality on which that northern country was "located" by Hall's party.

Ice.—This was found to increase in thickness as the Expedition proceeded northwards, and a strong presumption exists that the nearer we approach the Pole the thicker it will be, and the less hope there is of ever finding navigable water. There are, however, grounds for belief, after carefully studying Capt. Nares's Report, that possibly, under very favourable circumstances, the ice may break up so far as to allow a ship to proceed a little further north. There is, nevertheless, no ground for supposing that this would alter the conclusion to which he has come about the frozen Polar Sea.

Meteorology.—Until the meteorological observations are properly analyzed, nothing but general conclusions can be drawn from them. There is evidence of strong winds prevailing in Robeson Channel. The weather at the winter quarters of the Alert was, however, very calm; "indeed, we may say to have wintered on the borders of a Pacific sea." The prevailing wind was from the westward; "we never experienced any easterly winds; it always blew off the land. Had it not been for the intervening calms, the persistent westerly winds might have been well called a trade wind." This quiet state of the atmosphere was, however, productive of great cold. Early in March, during a continuance of cold weather, the Alert registered a minimum of 73°·7 below zero, the Discovery, at the same time, 70°·5. In 1850, the North Star, in Wolstenholme Sound, in lat. 76° 30′, recorded 69°·5 below zero. The Alert's minimum temperature for twenty-four hours was 70°·31 below zero, the Discovery's 67°. Dr. Kane's, in lat. 78° 37′, in 1854, reached 58°·01 below zero. In lat. 76° 52′ N., Belcher records a mean temperature during the winter of 1853 for ten consecutive days of 48°·9 below zero. The Alert experienced a mean temperature for thirteen days of 58°·9, and for five days and nine hours of 66°·29. We have no record of the mean winter temperatures or the maximum heat experienced, so that as yet we do not really know the climate of the Alert's or Discovery's winter quarters. With the prevalence of a south-west wind, warm weather, as is the rule on the whole Greenland cost, came, but immediately the wind fell cold returned. After the autumn snow, little fell, and (strange to say) much trouble was experienced in getting enough to bank up the ship, it having to be dragged on the sledges from a distance.

The Northern End of Greenland.—In the "Arctic Paper of the Royal Geographical Society" it was speculated whether it might not be possible for Capt. Nares to work his way through the ice, if sufficiently broken, round the Northern end of Greenland. It is curious to find that there was not only a possibility of doing this, but a great risk. "A vessel once caught in the pack ice off that coast, if not crushed at once, runs a great risk of being carried by it to the eastward, round the northern coast."

Navigation of Smith's Sound.—Capt. Nares considers that the success of the Polaris in getting so far north with so little trouble was owing to "her leaving the entrance of Smith's Sound at an opportune moment late in the season; had she left at any other time, she would have experienced the same trouble in going north in 1871, as in returning south the following year. To the latitude of Polaris or Discovery Bay, if no accident happens to the ship, the passage may be probably made, with perseverance, most years by starting early in the season, but it will be at all times a most dangerous one."

Eskimo.—It is stated, "with confidence," that after a careful examination of the coast north of Cape Union, it is the belief of Capt. Nares that no natives ever had a permanent settlement on that shore.

Drift-wood.—The pieces found were all fir or pine. There were also seen on the northern coast raised beaches, which Capt. Nares considers conclusive of the coast rising. However, these beaches are also found in Danish Greenland, in which the coast is as certainly falling. In fact, it only proves a former rise of the coast, which may be again falling, nevertheless.

Game.—The Alert's game-bag was poor. However, the Discovery crew were more fortunate, killing, as they did, a large number of musk oxen and other animals.

In conclusion, Capt. Nares pays a high tribute to all his officers and men, and especially to Capt. Feilden, R.A., whose services were of much value. We shall, therefore, look for the detailed Report of the gallant and learned naturalist of the Alert with no little interest, confident that so diligent and competent an officer will give an excellent account of himself. Altogether, Capt. Nares's Report bears out the opinion we had already come to from a perusal of his earlier summary, viz., that the Arctic Expedition could not have been better commanded or officered, and that the explorers did all that in reason they could have been expected to do.

ON LIGHTHOUSES IN JAPAN.

By Mr. R. H. Brunton, M. Inst. C.E.

A clause in the treaties, between European powers and Japan, stipulated that the ports open to foreign trade should be provided with "such lights as may be necessary to render secure the navigation to the said ports." The Japanese Government consented to the erection of eleven Lighthouses for this purpose, and requested the cooperation of the English Government in their establishment. The matter, having been placed under the authority of the Board of Trade, was referred to Messrs. D. and T. Stevenson, M.M. Inst. C.E., the Engineers to the Commissioners of Northern Lights. The Author was then appointed Chief Engineer, and proceeded to Japan in 1868. For the lights authorised, five sites were generally concurred in as being suitable, but there was considerable disagreement regarding the most advantageous positions for the other six. A Commission, composed of the Senior Naval officers in Japan of England, France, and America, was therefore formed, and their recommendations were carried out. The Author made his first visit of inspection round the coast in H.M.S. Manilla. The sites of the Lighthouses decided on were visited, and suggestions made for the illumination of the Inland Sea. This sea was 250 miles long, and at some places fifty miles wide, and was filled with several thousand small islands. While the work of completely lighting this sea would be one of magnitude, and of doubtful utility, a few lights might be so placed that, with their assistance, a considerable portion of the sea would become navigable at night, and vessels would be guided to anchorages where they might wait for daylight. With these objects eight Lighthouses were proposed, and finally authorised.

The Government soon after issued a proclamation, abolishing the old system of wood fires, and calling on the local authorities to name places where lights were required. In response to this appeal eleven Lighthouses had been erected. From a desire to perfect the illumination of the coast, the Government also decided to place lights on those points most prominently in need of illumination. The Author drew out a complete scheme for the lighting of the entire coast. Those sites which were considered most important were first dealt with, and seven Lighthouses had been erected. In all, thirty-six lights had been established on the coast of Japan, viz., ten first-order, four second-order, four third-order, seven fourth-order, three fifth-order, one sixth-order, five staff lights, and two lighships; in addition to which there were thirteen buoys and three beacons.

The liability of the country to earthquakes was an important point for consideration in the construction of the Lighthouses. Messrs. D. and T. Stevenson, who designed the apparatus, devised what had been named an aseismatic joint, by means of which a break was made in the continuity of a structure, and the propagation of a shock from the foundation upwards was prevented. This was accomplished by the introduction of balls working in cups placed between the platforms, the lower platform being fixed to the foundation, and on the upper platform the superstructure was erected. This arrangement was sanctioned by the Board of Trade for the apparatus of the first lights ordered; but, in the author's opinion, it was defective, in so far that the free motion of the upper, over the lower, part of a structure would, on the occasion of disturbances, such as a gale of wind, give rise to a distressing, and in some cases probably a destructive, motion in the superstructure. There being two movements in all earthquakes, one tending to overthrow, and the other to restore equilibrium, if a building could be constructed with a sufficient power of resilience, its destruction could not occur, unless the oscillation went beyond its limit of equilibrium. The houses in Japan had been evidently built with this principle in view. They had a light wooden framework and a heavy roof, and they were so made as to be capable of being moved off the vertical to a considerable extent without fracture. But, it being impracticable to follow this method of construction in the lighthouses, the author adopted the only other alternative, viz., giving them great weight and solidity, and so adding to their inertia and checking their oscillation.

The general form and dimensions of the Lighthouses were similar to those in this country. The stone used was principally granite. Eight Lighthouses had been built of the best procurable qualities of bricks. The natives had never adopted lime mortar in their building operations, but an excellent quality of limestone existed in the country. There were eleven wooden Lighthouses and four of iron; the material for the latter being imported from England. Mikomoto, or Rock Island Lighthouse, was the one in the construction of which the greatest difficulties had been experienced. It has been built on a rock, 6 miles from the shore, exposed to heavy gales; and although this rock was 100 feet high, the waves at times went right over it. Yeboshishima Lighthouse had been built on a conical rock, 10 miles from the mainland. It was 120 feet high, and owing to the rugged nature of the rock some difficulty was experienced. Satanomisaki (*Chichakoff*) Lighthouse was built on a rock, 300 yards from the shore, and, on account of the constant turbulence in the sea at this point, communication was for some time conducted by means of cages travelling over a wire rope suspended between the rock and the mainland.

The apparatus for the lights first ordered consisted of Stevenson's holophotalized reflectors, twenty-eight being grouped on a frame, in order to exhibit a first-order light. But the heat impaired the ventilation of the laterns to so great an extent, that dioptric apparatus, with single flames in their foci, had been procured for the later lights. The apparatus was made from the designs of Messrs. Stevenson by Messrs. Chance Brothers, of Birmingham, and Messrs. Sautter, Lemonier, and Co., and Messrs. Barbier and Fenestre, of Paris.

Owing to difficulties in procuring reliable vegetable oil, mineral oil was adopted as soon as possible. Although petroleum existed in large quantities in Japan, its properties were not well known, and paraffin oil was therefore procured from Scotland. Captain Doty's burner had been selected, and the experience of its working fully bore out the inventor's statements regarding its merits.

The Lighthouse establishment was situated at Yokohama, and contained offices, workshops, and machinery, by means of which the wooden and iron Lighthouses, the Lightships and the Buoys had been constructed and fitted up. The number of Europeans engaged by the Department had been twenty-five, fifteen of whom were lightkeepers. One hundred Japanese lightkeepers were now undergoing a process of training, but only a few of them showed much proficiency. The working of the Department was directed by a Japanse Commissioner, and a staff of fity-three assistants.

The Japanese officials having kept entire control of the expenditure, the author had no personal knowledge of it, but he had been informed that about £450,000 had been expended up to the end of 1875.

The civil war having just terminated on the author's arrival in Japan, great difficulty had been experienced at the commencement of the work in getting attention paid to it. There was further an absence of trained workmen, and a comparative ignorance of the character of the material to be employed. Nothwithstanding, the the Lighthouses had been well finished, and there had been, so far, no signs of failure in any of them. Mariners frequenting the coasts spoke highly of the lights; and credit wasdue to the Japanese Government for its liberality in the prosecution of the work.—*Abridged from a Paper read at the Institution of Civil Engineers.*

EGERTON'S TIDAL PIER.

THE object of this invention, which was experimentally tested and demonstrated by a model at a meeting of men of practical science and others at the Robin Hood Tavern, River Lea, is to facilitate heavy traffic of every description, to enable heavily-laden waggons and carts, as well as passenger and goods trains, to continue their journey, with little delay and without change, across tidal rivers, arms of the sea, &c.

By this invention one of the most urgent requirements of the day has been supplied, so that the absence of a bridge across a tidal river will no longer entail the necessity of sending goods by waggon, &c., miles roundabout to find the nearest bridge, or the hitherto inevitable expense, delay, and inconvenience of two or more changes from waggon or railway carriage to steamer, barge, or other vessel, and back again to rail or waggon. Neither will any great expense be necessary in order to attain this object. Vehicles of every description at all states of the tide may avail themselves of this pier; and the invention can, in the generality of cases, be applied to existing piers of various kinds.

The chief reason why ferries for taking over loaded waggons, railway carriages, &c., have never yet under any circumstances become popular, is that the difficulties encountered in getting on board and off again have been (at certain states of the tide) almost insurmountable, the result being that the employers of heavy vehicles have preferred, as a rule, going many miles round rather than incur the risk of a ferry and its approaches; nor is this to be wondered at, since almost invariably at low tide their horses would be compelled to go either down or up inclines totally unfit for such traffic, or, where the gradient was more reasonable (for instance, when the roadway was a permanent one, and therefore alternately covered and exposed by the tide), they would have had a considerable distance to draw their loads over a bad road, covered with slippery mud, sea-weed, &c.; and it should be borne in mind that such a road cannot well be retained in good condition, since the action of the rising and falling tide cannot fail to injure it. Again, in consequence of this objection to ferries generally, and therefore the small demand for their services, vehicles have, as a rule, too long a time to wait for a boat, and the requirements of horses, drivers, &c., are rarely studied; moreover, where a chain is used for the purpose of hauling in (when crossing over), the progress made is both tedious and obstructive.

Up to the present time, no reasonable method of conveying a whole train across a tidal river or arm of the sea has been attempted, and the delay and expense experienced where any moderate expanse of water intervenes between one terminus and another has been excessive; and hitherto the constructors of railway lines, like the designers of ordinary roads, have preferred going miles out of their course rather than face the difficulties of a small sheet of water. The necessity for building enormously expensive bridges, or skirting miles round an arm of the sea or tidal river, no longer exists: there is no reason why any description of vehicles (railway carriages included), on arriving at the water-side, should not continue their course until arriving on board a specially-constructed ferry-boat, by that means cross the water, and so gain the other side without any appreciable delay, with a trifling preliminary expense in constructing piers, boats, &c., and moderate working expenses.

This invention may be described as consisting in a cheap and durable Floating Pier, which may be so constructed as to form, at any state of the tide, any incline which may be considered most desirable; and as the approach (or incline to the pier) will regulate itself according to the height of the water, no expensive machinery (hydraulic or otherwise) will be necessary. Waggons, &c., will be enabled to drive on board the ferry boat, and, when landing, leave it again with as much ease as that with which they perform any other portion of their journey. It may, perhaps, be as well to point out some of the reasons why hitherto heavy traffic (unless unloaded, ferried across, and loaded again) has usually been diverted from its direct course by tidal rivers and arms of the sea (where the expense of constructing a bridge would have been too great), thereby, as in London and other densely-populated cities, causing at times an absolute cessation of traffic, in consequence of the utter inability of existing bridges to accommodate the increased burden unnecessarily thrown upon them.

Any railway company who might apply this pier to such a landing-stage as the one at Liverpool, would obtain great advantages. It is only necessary to land at Liverpool from the United States or elsewhere, in order to become painfully aware of the inconvenient and expensive method of transferring oneself and one's impedimenta from steam tug to rail, and to those who have experienced these unpleasant adjuncts to a voyage, little need be said to render self-evident the satisfaction of having railway carriage and baggage van alongside of one on the landing-stage.

The principle of this invention is to construct piers of one or more platforms connected by hinges—one end of which pier is fixed where required to the ground or pier leading to a landing stage or beach, and the other end is in proximity to a landing stage or beach at low water. These platforms are suspended from the water by air-tight pontoons of various sizes, and so arranged that the deflection of the floating pier can be regulated to sustain this floating pier at a uniform incline throughout its length, and at a direct connection with a landing stage or beach at all times, according to the state of tide. This enables the floating piers to be always available for heavy traffic. The platforms of these piers are placed between two rows of pillars, one on each side of the same, having girders and connections to allow the free rising and falling of the platform with the tide; and such pillars can be so placed and sustained as to withstand the heaviest seas or tides in all circumstances, whether in the sea or in rivers.

Amongst the advantages of this invention, the inventor claims the following:—1st. A great saving in the cost of transporting goods across all such rivers as the Thames (below bridge), the Mersey, &c. 2nd. A very strongly marked relief to the overwhelming traffic of the City of London. 3rd. A most important saving in time and expense in conveying railway trains, direct and intact, from one side of a tidal river or arm of the sea to the other. 4th. A great saving in the construction of both piers and approaches as compared with those at present in use.

It is worthy of notice that no large sum of money would be necessary in order to apply this invention to existing piers, whether floating or otherwise; and there can be no doubt that in almost every case where a ferry already exists this invention would soon be found necessary, and as soon as its success is once recognised many more ferries would be required.

Between Liverpool and Birkenhead, the north and south sides of the Thames (below bridge), and even up and down the river, numbers of carriers would liberally avail themselves of such a means of saving both time and money.

The pier may be readily arranged in such a manner as to suit any spot where it may be required. It can be placed, either at right angles to the shore line, parallel to it, or at any desirable angle. It may be constructed with any number of supports, with one or any number of pontoons, with one or any number of girders, and of any strength which may be considered necessary. If properly constructed it cannot get out of order, and requires no attention.

ON THE MANUFACTURE OF BLACK INK.

BY the term ink, we understand a liquid mixture with which we can write and draw upon paper. The qualities demanded of a good ink are that it shall flow well but not too freely from the pen, shall fix itself properly to the paper, without, however, blotting or spreading, and preserve its own colour permanently.

There are in existence at the present time an innumerable quantity of recipes for the manufacture of black inks, and yet we hear the general complaint either that the ink is too pale when written, and therefore injures the eyes when used continuously, or that when the writing gets old it fades or turns brown. James Stark, a Scottish chemist, has prepared about 230 kinds of black ink, and found, as he expresses it, only one to be recommended, namely, an ink made from myrobalanen.

The cause of black writing turning pale, and disappearing entirely when it gets old, is to be found in the iron it contains, in so far as the iron is changed to a higher oxide and is precipitated. Ink made with nutgalls is a special case of this kind ; it is in a continual state of decomposition ; when this process is ended, the ink in a short time becomes useless. Free sulphuric acid retards this rapid and complete destruction, hence sulphate of indigo is added.

A decoction of gall nuts contains tannic acid ; this combines with protoxide of iron to form a tannate (proto-tannate of iron), which is colourless, but very greedy for oxygen, and strives to change itself into the sesquioxide salt. Finally the tannic acid changes into gallic acid, and a black protogallate of iron is formed. At last, when all the tannic acid in the proto-tannate of iron is converted into gallic acid, it continues to absorb oxygen and forms the tannate of the proto-sesquioxide of iron, which separates as a shiny precipitate. The sediment in the ink is continually growing thicker, and of course it can no longer be used.

In the manufacture of ink, any substance containing tannin may be used in connection with the iron salts, such as galls, tannin, divi divi, myrobalanen, extract of nut shells, &c. Black inks are also made of logwood and iron salts on the one hand, and neutral chromate of potash on the other. Alizarine ink consists of protoxide of iron and indigo solution ; it generally has a bluish green colour, and afterwards darkens beautifully ; the more acid the ink contains, the slower this takes place. Slightly acid inks scarcely perceptibly attack steel pens, but spoil sooner, with the formation of a blue-black precipitate. They are usually and best prepared with madder, gall nuts, indigo carmine, and acetate or pyrolignate of iron.

It did not lie in the province of the above few lines to present a selection of the best ink recipes, but only to explain the phenomena which appear in the use of black inks. If such a recipe is introduced in the following description of its method of preparation, we only do it under the conviction that we meet the wishes of many of our readers by giving one that has been tested by years of experience, and which involves the least cost.

When black ink is made in large quantities, it is well to let it become clean in large barrels and afterwards put it into bottles and inkstands. It is believed that in this way an article is obtained which is less exposed to mould. To avoid this unpleasant feature, a small quantity of corrosive sublimate, or a few drops of carbolic acid, or some broken cloves, may be put into the ink.

Numerous experiments have shown that no salt of iron and no iron preparation equals the proto-sulphate of iron (the green vitriol of commerce) in the manufacture of ink, and also that the admixture of a salt of the sesquioxide, for instance the nitrate or chlorides, although it improves the colour of the ink at first, renders it less durable. The most permanent of the common inks are those made of gall nuts, with green vitriol and gum arabic. The proper proportions of these constituents for the production of such a durable black ink are the following: Two lbs. bruised Aleppo gall nuts are digested in 2 quarts alcohol at a temperature of 104° to 140° Fah. ; when about half of the spirits has evaporated, 3 quarts water are added ; it is well stirred and strained through linnen cloth. To the clear solution are added 8 ozs. glycerin and 8 ozs. of gum arabic with 1 lb. sulphate of iron dissolved in water. This mixture is thorougbly stirred from time to time for a few days, allowed to settle, and then put into well-stoppered bottles for preservation.

Care should be taken to avoid the addition of too much sulphate of iron, as otherwise the ink soon turns yellow.

An ink prepared according to these directions will resist the action of light and air at least 12 months without suffering the slightest change of colour. If this ink could be completely protected against precipitation of gallate of iron, we should have a perfectly permanent ink, retaining its beauty. The addition of sugar as well as of logwood decreases these properties.—*Victor Soclet, in Polytechnisches Notizblatt.*

CHROMIC INKS.

As long ago as 1848, Professor F. Runge invented what he called a chromic ink, from its containing chromate of potash. His directions for its preparation, published at the time in Dingler's *Journal*, were as follows :—A decoction of logwood is first made in the proportion of 10 to 80, that is 10lbs. logwood is boiled with enough water to produce 80lbs. of the decoction. To 1,000 parts of this logwood extract, when cold, is added one part of yellow chromate of potash, stirring rapidly. It is ready for use at once. Gum and other additions are injurious, he says, to this ink.

The following year W. Stein proposed an improvement on Runge's ink, saying that the great fault of this ink was that it soon became thick, like sour milk. This he overcame by adding four grains of corrosive sublimate to each bottle. This would restore thick ink to its pristine quality, and improve its colour changing it from deep indigo blue to pure black.

In 1867, C. Puscher described a new ink similar to the above, made as follows :—Boil 10 ozs. of logwood in 20 ozs. of water, then boil again in 20 ozs. more of water, and mix the two decoctions ; add two ozs. of chrome alum and boil another quarter of an hour. One oz. of gum arabic is added, and we have 25 ozs. of deep black ink.

Böttger says that a simple method of preventing gelatinizing in chromic ink is to add to the water in which the extract is made some carbonate of soda. His method of operation is as follows :—Dissolve 15 parts of extract of logwood in 1,000 parts of distilled water to which four parts of carbonate of soda has been added at boiling heat, and add one part of yellow chromate of potash dissolve in a little water.

CALLEY'S SYSTEM OF SEWERS AND SEWAGE.

We are requested to give insertion to the following letter on the above subject, (received on 20th October last, too late for insertion in our last month's issue), addressed to the Society of Arts, which we do with much pleasure, as we think Mr. Calley's views are worthy of earnest attention :—

46, Southampton-buildings, W.C.
London, Oct. 19th, 1876.

SIR,—Seeing that the council of the Society of Arts have invited suggestions on sewers and sewage, and as those matters have long engaged my attention, with a view of making sewage less injurious to health and valuable commercially, I beg to forward you my ideas on the same, by the adoption of which I believe those results may be obtained.

At present most main and other sewers have only one channel in them, through which the sewage possessing fertilizing properties is conveyed in combination with refuse from works and factories, and at times with large quantities of water and refuse from streets, roads, &c. ; the result is that in wet seasons this valuable sewage is injured by being too diluted, and at this and all other seasons its value is deteriorated from adulteration and other causes.

The consequence is that town sewage has not been much used as a manure ; but if the sewage which has fertilizing properties were conveyed by itself to the outfalls of sewers with only sufficient water to keep it always in such a semi-fluid or pulpy state that it would retain those valuable properties at the outfalls, there is then but little doubt of this portion of sewage being made a profitable commodity, owing to its superior qualities as a fertilizer.

To effect this and convert what is now a nuisance and injurious to health into valuable property, I propose that in constructing main and other large sewers there should be in their whole length one upper or somewhat upper sewer, to convey *only* the water and refuse from streets, factories, &c., and another sewer either underneath or alongside, or at some moderate distance parellel to, but in connection therewith, to convey *only* house or other fertilizing sewage, together or separately, as preferred, in which latter case this sewer could be subdivided, but it should be so placed as to allow the admission of water from the upper sewer *above* the fertilizing sewage passing through this lower one.

With regard to sewers already in use, those large enough to allow another channel being formed in them, could be altered for those purposes, but if not, others should be placed near thereto as before described, and the present sewers could be used to convey *only* the water from streets, factories, &c,. or to convey *only* the fertilizing sewage, as deemed advisable.

Respecting the small sewers and drains of houses and other places discharging into large sewers. These should all have their lower ends efficiently trapped, at their junction with those sewers and all the parts of sewers conveying fertilizing sewage, should be cemented or have smooth surfaces.

As to ventilating shafts, these should have apparatus to close them when fog, smoke, or rain-clouds are just above their upper ends, as at such times the gases from sewers cannot escape upwards through such fogs and clouds, but are wafted to and fro beneath the same, and disseminated into the houses and neighbourhoods near those shafts. This applies more especially to London and large or manufacturing towns, and to mansions admidst high trees.

At the highest point of main or large sewers there should be provided reservoirs or cisterns of water for supply the lower sewers with water when necessary, and these reservoirs could be utilized for swimming baths or other purposes

To ascertain whether the fertilizing sewage is always in a proper state, gauges could be placed at intervals in large sewers, and valves or other apparatus affixed therein, and in the reservoirs to regulate the flow of water required at any time, and telegraph wires could be used for communication between the reservoirs, gauges and outfalls of sewers.

At the outfalls of all main sewers, the fertilizing sewage should be conveyed by itself into reservoirs provided for the purpose ; but the surplus water and refuse from the upper sewer should be diverted some other way clear of the same.

S. CALLEY.

FOREIGN SCIENCE.

THE pressure of other matter compels us to present the briefest possible record of the progress of Foreign Science during the month, we can just find space to notice that Professor Grassi, of Pavia, has published, under the auspices of the Milan Section of the Italian Alpine Club, a valuable treatise on the measurement of heights by the barometer. Also to direct attention to "The History of the Steam-Engine in America," which appears in the *Journal* of the Franklin Institute for August. It is founded on letters, papers, and a report by Mr. Latrobe, in connection with the Centennial Exhibition, in reply to an inquiry "Whether any, and what, improvements have been made in the construction of steam-engines in America."

The work of Padre Secchi, "Sur l'Unité des Forces Physiques," has been translated into the Russihn language. This translation has been printed at Viatka, close upon the coufines of Siberia.

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Editor's Office: 21, *Cockspur Street, Charing Cross, S.W.*

THE INVENTOR'S INSTITUTE,

4, ST. MARTIN'S PLACE, TRAFALGAR SQUARE, LONDON.

ESTABLISHED 1ST MAY, 1862.

Past Presidents:

SIR DAVID BREWSTER, K.H., LL.D., F.R.S., &c., from the establishment of the INVENTORS' INSTITUTE, till his decease, February, 1868. LORD RICHARD GROSVENOR, M.P.

President, SIR ANTONIO BRADY.

SESSION 1875-76.

MEMBERS' MEETINGS AT 8.15 P.M.

Thursday, December 14th.—Exposition of Inventions.
Council Meeting same day at half past 7 p.m.

Subscriptions are payable to Mr. G. A. STRETTON, the Receiver, 4, St. Martin's-place, S.W., who is the proper official to give receipts.

F. W. CAMPIN, Sec.

Proceedings of the Institute.

THE principal business transacted at Council Meetings has had reference to the Inventors' Dinner on the opening day of the Session (30th Nov.), and as this is to take place on the same day that we go to press, we have to reserve our report of the proceedings.

The Session thus inaugurated is expected to be one noteworthy in every respect. Those Members who wish to read papers or assist in Conferences on the Patent Law are requested to make early application to the Secretary.

Monthly Notices.

The Royal Society Medals are, it appears, awarded—the Copley medal to Prof. Claude Bernard, for his contributions to the science of physiology; a Royal medal to Mr. William Froude, F.R.S., for his researches, both theoretical and experimental, on the behaviour of ships, their oscillations, their resistance, and their propulsion; a Royal medal to Sir Wyville Thomson, F.R.S., for his successful direction of the scientific investigations carried on by Her Majesty's ship *Challenger*; the Rumford medal to M. B. J. C. Janssen, for his researches in the radiation and absorption of light, carried on chiefly by means of the spectroscope; two distinguished foreigners (Frenchmen) are also to receive medals.

The Royal Society Council and Officers for the year ensuing has been thus nominated: President, Dr. J. D. Hocker; Treasurer, W. Spottiswoode; Secretaries, Prof. G. G. Stokes, and Prof. T. H. Huxley; Foreign Secretary, Prof. A. W. Williamson; other members of the Council, Major-General J. T. Boileau, Dr. Warren De La Rue, Prof. P. M. Duncan, Prof. W. H. Flower, Prof. M. Foster, Dr. E. Frankland, F. Galton, W. A. Guy, J. R. Hind, the Rev. R. Main, W. Pole, the Rev. B. Price, Rear-Admiral G. H. Richards, H. C. Sorby, Prof. H. J. S. Smith, and Prof. Balfour Stewart.

Mrs. Grace Calvert has presented the sum of £700 to Owens College, Manchester, for the foundation of a scholarship in chemistry in memory of her late husband.

The List of New Explosive Compounds, with new and strange names, which almost weekly claim attention, is curious. In addition to "Tonite," we have now "Lignose," made of wood-fibre and nitro-glycerine, and "Pantopollitt," a kind of dynamite with naphthaline.

The Memoir of the late Sir W. Fairbairn, Bart., F.R.S., the distinguished mechanical engineer, is nearly ready for press, and the announcement of its publication will shortly appear. The editor is Prof. W. Pole, F.R.S., who has been entrusted by the family with all letters and documents requisite.

The Transformation of Gravity is the subject of a Paper by Dr. James Croll, in the *Philosophical Magazine*, for October, in which he attempts to answer the question; is gravity convertible into other forms of energy?—concludes with the following remarkable paragraph:—"If gravitation were an impact, no planet nor comet could move everlastingly in an elliptic orbit. But the mutual disturbing forces of the planets will always maintain them in elliptic orbits, and it would, therefore, follow that gravity alone, without any resisting medium, would ultimately bring the planets to the sun."

The Liebig Memorial, for which 140,000 marks has been collected, has been the subject of a discussion about the site of the projected monument, which has arisen between the rival committees of Giessen and Munich, the former claiming the statue on the ground that from their university Liebig's fame first issued to the world; the latter because their capital was latterly the scene of his labours. It has been decided, says the *Athenæum*, that both towns shall have the same memorial, which shall be cast in bronze, the sum collected sufficing to cover these double expenses.

The Geological Constitution and the Mineral Wealth of New Caledonia is the subject of a very important report that has been made to the Ministre de la Marine et des Colonies by M. Emile Heurteau, and which occupies 225 pages of the *Annales des Mines*, the second and third parts for 1876.

Chilling Car Wheels. A new invention employs metallic annular chills, with annular air-chambers at those points of the interior surface of the chill where the outer flange and tread peripheries are formed. Thus the central portion of the tread is chilled and hardened; but the flange and outer thread periphery, are left tough and strong.

Cassell's Dictionary of Cookery still maintains the high character it possessed at starting. If it continue in the same course it will do much to improve the art of cookery, and to elevate it to the rank of a practical science.

Proceedings of Societies.

ROYAL SOCIETY.

Nov. 16th.—Dr. Hooker, C.B., President, in the chair. Capt. Nares and Dr. Armstrong were admitted into the Society. The following papers were read: "Experimental Contributions to the Theory of the Radiometer," by Mr. W. Crookes, "Magnetic Observations made at Stonyhurst College," by the Rev. S. J. Perry, and "On Electrical Conductivity and Electrolysis in Chemical Compounds," by Dr. L. Bleekrode.

ROYAL INSTITUTION.

November 6th.—Admiral Sir H. Codrington, V.P., in the chair.—Dr. R. J. Mann and Mr. J. R. Shaw were elected Members.

PHYSICAL SOCIETY.

November 4th.—Prof. G. C. Foster, President, in the chair. The following candidates were elected members: Messrs. Warren De La Rue and W. H. Preece. Dr. Guthrie read two letters from Dr. Forel, in continuation of a communication made to the Society on the 27th of May last, in reference to the "sieches" or periodic oscillations which take place in the Swiss lakes. Since his communication, Dr. Forel has found, in a pamphlet by Dr. J. R. Mérian, published in 1828, a formula which is strictly applicable to the phenomena under consideration. If t be the duration of half an oscillation, h the depth of the lake, and l its length—

$$= \sqrt{\frac{\pi l}{g}} \left\{ \frac{e^{\frac{\pi h}{l}} + e^{-\frac{\pi}{l}}}{e^{\frac{\pi h}{l}} - e^{-\frac{\pi h}{l}}} \right\}^{\frac{1}{2}}$$

Considering that probably this formula will be applicable to lakes of irregular depth, if h be the mean depth, he has applied it to several lakes, and the following are some of his results. In the case of transverse seiches on Lake Leman, the formula gives 216 métres as a mean depth, and 334 métres is the greatest known depth. With a longitudinal oscillation the mean depth is found to be 130 métres. In the case of Lake Wallenstadt, the formula having shown the mean depth to be somewhat greater than the generally accepted greatest depth, Prof. Forel took a number of fresh soundings, and found a great basin of comparatively even bottom, and of such a depth as to render probable the mean depth given by the formula. Dr. Stone exhibited some diffraction gratings, on glass and metal, ruled for him by Mr. W. Clark, of Lower Norwood. Dr. Guthrie briefly described some experiments which he has made to determine the effect of a crystalloid on a colloid when in the presence of water.

Nov. 18th.—Prof. G. C. Foster, President, in the chair. The following candidates were elected Members: Major W. Malcolm, Prof. J. M. Purser, Dr. W. Francis, Messrs. G. J. Stoney and D. M'Alpine. Mr. Tylor read a paper "On the Cohesion and Capillary Action of Films of Water under Various Conditions." The author endeavours to eliminate the action of all forces, except that of gravity, by immersing his "valves" in water. The models which he exhibited consisted of glass tubes about 3 in. in diameter and 6 in. high, filled with water, and containing each a piston which, on being raised, was capable of lifting by cohesion a heavy mass of metal, the nature of the surfaces in contact differing in the several instruments. From experiments with these, he concludes that the time during which a heavy valve can be supported depends upon the size of the surface of contact, the difference of pressure within and without the moving parts, and the smoothness of the valve. On the contrary, dry bodies, such as Whitworto's surface planes, will adhere for an indefinite period. Mr. Tylor considers that the supporting of a body in water is due to a difference of pressure in the water itself, and he adduced Giffard's injector as showing that such difference can take place. He has also studied the form assumed by a drop of water at a tap, and considers that when a fly walks on a ceiling, its weight acts in the same manner as the heavy valves in the models exhibited. Prof. Shelly exhibited some of Sir J. Whitworth's surface planes and gauges, and showed their bearing on the subject. Dr. Stone then projected on to the screen the spectra produced by the diffraction gratings which were exhibited at the last meeting of the Society. When received on a screen, at a distance of about 25ft., they showed bright bands in the red and violet after transmission through a strong solution of permanganate of potash. Mr. Clark has since ruled for him gratings on the backs of right-angled prisms, and Dr. Stone has cemented by means of glycerine, or oil of cassia, gratings on glass and steel on such prisms. The lines were 2,000 and 3,000 to the inch.

SOCIETY OF ARTS.

Nov. 15th.—Lord A. S. Churchill in the chair. Ninety-six new members were proposed for election. The chairman of the Council, Lord A. S. Churchill, delivered the usual address at the opening of the session. The principal topics dwelt on were town drainage and Patent Law Reform. Other subjects with which the Society is engaged were also referred to.

Nov. 22nd.—Lord Alfred S. Churchill in the chair. Seven new Members were proposed for election. The paper read was "On Collapsible Boats: their Peculiarities and Advantages," by the Rev. E. L. Berthon.

CHEMICAL SOCIETY.

November 2nd.—Prof. Abel, President, in the chair.—The President announced that the Goldsmiths' Company had contributed £1,000 to the recently-established research fund of the society. Mr. Lupton read a paper, "On the Oxides of Potassium," after which communications were read, "On Certain Bismuth Compounds, Part III.," by Mr. M. M. P. Muir,—"On Phospho and Arseno Cyanogen," by Mr. W. R. Hodgkinson, — "A Secondary Oxidized Product formed during the Reduction of Stannic Ethide to Stannous Ethide," and a preliminary notice "On Pigmentum Nigrum, the Black Colouring Matter contained in Hair and Feathers," both by Messrs. W. R. Hodgkinson and H. C. Sorby.

November 16th.—Prof. Abel, President, in the chair.—A paper "On Barwood," by the late Prof. Anderson, was read by the Secretary, describing the methods of preparing *baphuin* from it, and also some of the educts obtained by the action of various reagents. "On the Alkaloids of the Aconites: Part I., on the Crystallizable Alkaloids contained in *Aconitum napellus*," by Dr. C. R. A. Wright. The author finds that the alkaloid from *A. ferol* which he calls *Pseudaconitine* $C_{36}H_{49}NO_{11}$, differs both in properties and in composition from *Aconitine*, $C_{33}H_{43}NO_{12}$, the crystalline alkaloid of *A. napellus*. In one instance, however, he obtained from the root of the latter a perfectly distinct bitter crystalline alkaloid, *Picraconitine*, possessing scarcely any toxic power; whether this is an alteration product of aconitine or not remains at present undetermined. Mr. G. S. Johnson read a paper "On Potassium Tri-iodide," a crystalline compound obtained on saturating a saturated solution of potassic iodide with iodine, and slowly evaporating the solution over sulphuric acid. It forms prismatic or tabular crystals, having an appearance very similar to that of iodine. "On the Coal Gas of the Metropolis," by Mr. T. S. D. Humpidge. He has carefully analyzed and determined the illuminating power of different samples, and comes to the conclusion that the gas at present supplied is but little, if any, better than it was twenty-five years ago, the actual increase in illuminating power being due to the use of improved burners. This paper gave rise to considerable discussion.

GEOGRAPHICAL SOCIETY.

November 13th.—Sir R. Alcock, President, in the chair.—The following gentlemen were elected Fellows: Messrs. P. G. Lawrie and L. Rosenthal. — The President gave his Opening Address.—The paper read was "On the Buried Cities of the Gobi Desert, Eastern Turkistan," by Sir T. D. Forsyth.

ASTRONOMICAL SOCIETY.

November 10th. — Mr. Huggins, President, in the chair.—The Astronomer-Royal gave a short account of the proceedings of the Royal Observatory during the recess, describing the lunar and physical observations, which had been assiduously prosecuted, and the state of the calculations for his new lunar theory.—A paper, by Prof. Lanley, of the Allegany Observatory, Pennsylvania, "On the Measurements of the Direct Effects of Sun-spots on Terrestrial Climates," was read. Prof. Langley has made experiments to determine the difference in the amount of heat radiated from the centre of a sun-spot, and from an equal area of penumbra, and photosphera, combining these results with the amount of the sun-spot area given as existing during a period of maximum of sun-spot frequency in the tables of Messrs. De La Rue, Stewart, and Loewy. He calculated that the mean terrestrial temperature due to solar radiation at a period of sun-spot minimum would be something between three-tenths and one-twentieth of 1° Centigrade greater than at a period of sun-spot maximun.—The Astronomer-Royal pointed out that the observations of underground temperature made at the Observatories at Paris, Edinburgh, and Greenwich, showed differences in the mean annual temperature of the surface soil which amounted to as much as 6° Fahrenheit. An examination of the temperatures at different depths showed that the differences of surface temperature had their cause in something external to the earth; but he had not found that the differences of mean surface temperature coincided with the variations in the amount of the English serial crop, as given by the Board of Trade returns, or with the periods of sun-spots maxima.—Mr. De La Rue said that it did not follow that the amount of solar radiation would necessarily vary inversely as the sun-spot area, for at a period of maximun sun-spot area it was possible that the radiation from the photosphere might be increased to such an extent as wholly to counteract the difference caused by the decrease in the apparent area of the photosphere. He further remarked that the numbers given in his papers, in conjunction with Messrs. Balfour Stewart and Loewy, must not now be relied upon, as some serious errors had been discovered, which he was endeavouring to put straight by a re-investigation of the whole subject.—Mr. Penrose read a paper, entitled "An Endeavour to Simplify the Method of making the Correction for the Spheroidal Figure of the Earth in Lunar Observations, and particularly with reference to its effect upon the Lunar Distance;" and the history of the subject was commented upon by Mr. Marth.—Mr. Christie described some observations which he had made with a polarizing photometer upon the relative brightness of different parts of the disc of Venus. He had found that when the disc of Venus was gibbous, the last part of the disc to disappear, as its brightness was decreased by rotating his photometer, was a sausage-shaped patch, the convex edge of which was found to be distinctly within the limb of the planet. He thought that his observations supported

Mr. Brett's theory as to specula reflection from the surface of Venus.—Mr. Ranyard said he had been unable to find evidence of polarization in the light of Venus, such as might be expected if light was specularly reflected from the body of the planet. He thought that the brighter sausage-shaped area seemed to indicate a dense atmosphere, which absorbed the light from the limb of the planet. With specula reflection the brighter patch would, he thought, certainly be circular and not sausage-shaped.

GEOLOGICAL SOCIETY.

NOVEMBER 8TH.—Prof. P. M. Duncan, President, in the chair.—Messrs. M. Attwood and R. W. Moor were elected Fellows.—The following communications were read: "A Short Notice of a New Exposure of Rhætics near Nottingham, in a letter from Mr. E. Wilson, dated November 3rd, 1876,"—"Note on the Red Crag," by Mr. W. Whitaker,—"On the Kessingland Cliff Section, and the Relation of the Forest-Bed to the Chillesford Clay, with some Remarks on the so-called Terrestrial Surface at the Base of the Norwich Crag," by Mr. F. W. Harmer,—and "Observations on the Geology of East Anglia, &c.," by Messrs. S. V. Wood, jun., and F. W. Harmer.

INSTITUTION OF CIVIL ENGINEERS.

NOV. 14TH.—Mr. G. R. Stephenson, President, in the chair. The paper read was "On the Japan Lights," by Mr. R. H. Brunton.

Nov. 21st.—Mr. G. R. Stephenson, President, in the chair. The paper read was "On the Fracture of Railway Tires," by Mr. W. W. Beaumont.

NUMISMATIC SOCIETY.

OCTOBER 19TH.—J. Evans, Esq,, President, in the chair.—Mr. J. H. Gibson was elected a Member.—Mr. T. Jones exhibited a collection of coins of Tarentum, Thurium, Syracuse, &c.—Dr. A. Smith exhibited a medal of the son of Napoleon I., executed by the late Mr. Leonard Wyon, at the age of sixteen.—Mr. G. H. Vize, in illustration of Prince Ghica's article, in the last number of the *Numismatic Chronicle*, laid upon the table the original dies used for striking the silver medal of Michael V., surnamed "the brave" Prince of Wallachia, 1593-1601. This rare medal is engraved in the *Numismatische Zeitschrift* of Vienna, vol. iv., pl. iii., fig. 8. Only two specimens are known, one of which is in the Vienna Museum, the other in the cabinet of M. Demetrius Sturdza, of Bucharest.—Mr. P. Gardner read a paper "On the Coins of the Cities on the West Coast of the Euxine, Tomi, Odessus, and Anchialus, &c." Mr. Gardner proved that these cities formed a monetary league among themselves, on the basis of an As weighing about forty grains, during the period between the reigns of Marcus Aurelius and Philippus.—Papers were also communicated by Dr. A. Smith, "On the Irish Coins of Henry the Eighth," and by Mr. R. W. C. Patrick, the latter entitled "Contributions towards a Medallic History of Scotland."

PSYCHOLOGICAL SOCIETY.

NOVEMBER 2ND.—Mr. Sergeant Cox, President, in the chair.—The following Members were elected: Messs. C. Holmes, S. T. Spiers, Martheze, and T. R. Kent.—The President read an Address on the Opening of the Third Session, in which he congratulated the Members on the flourishing condition of the Society, and reviewed the progress of Psychological Science during the past year.

November 16th.—Mr. Serjeant Cox, President, in the chair.—The following Members were elected: Messrs. G. R. Wright, A. Vicher, and Mrs. Gregory. Mr. E. C. Massey read a paper "On Unconscious Cerebration." Several reports of psychological facts and phenomena were read.

SOCIETY OF BIBLICAL ARCHÆOLOGY.

NOVEMBER 7TH.—Dr. S. Birch, President, in the chair. The President announced that it was intended to resume the Assyrian and Egyptian classes during the winter of 1876-7, and that Dr. Birch and Mr. P. Le Page Renouf would again take the Egyptian class, and Mr. W. St. Chad Boscawen the Assyrian. The classes to be held, by permission of the Council, on alternate Saturday evenings, at 5 P.M., at the new library and offices of the Society, 33, Bloomsbury Street. The following papers were read: "Memoir of the Life and Labours of the late G. Smith," by Mr. W. St. Chad Boscawen. In this somewhat melancholy *éloge*, a grateful tribute was paid to the memory of one of the first Assyriologists of his day.—"Notes on the Himyaritic Inscriptions contained in the Museum of the Royal Asiatic Society of Bombay," by Capt. W. F. Prideaux.—"Further Notes and Observations upon the Preceding Inscriptions," by Dr. Heinrich Muller.—"On the Writings of Ephræm Syrus," by the Rev. J. M. Rodwell.

MICROSCOPICAL SOCIETY.

NOVEMBER 1ST.—H. C. Sorby, Esq., President, in the chair.—The Rev. J. Spaven and Dr. W. Morris were elected Fellows. A paper, by Dr. G. W. Royston-Pigott, "On a new Refractometer," was read by the president, and illustrated by drawings and by the instrument, removed for the occasion from the Loan Collection at South Kensington. A paper, by the Rev. W. H. Dallinger, "On Experiments with Sterile Putrescible Fluids exposed in an Optically Pure Atmosphere, &c.," was read by the secretary, and the apparatus employed was sketched upon the black-board in illustration. A short discussion followed, in which Mr. C. Brooke, Mr. Stewart, Dr. Lawson, and the President took part. A paper, by Mr. F. H. Wenham, "On the Measurement of the Angle of Aperture in Object-Glasses," was read by Mr. Ingpen, and illustrated by drawings; and some further remarks upon the subject were made by the President, Mr. C. Brooke, and Mr. Ingpen.

PHILOLOGICAL SOCIETY.

NOVEMBER 3RD.—Mr. H. Sweet, President, in the chair.—Messrs. Brandreth and Cust, who represented the society at the Congress of Orientalists, at St. Petersburg, gave a report on the general results of the congress. Mr. H. Sweet read a paper "On the Text Criticism of the Anglo-Saxon Poetry." He drew especial attention to the Northumbrian element, and showed that many of the errors of the scribes might be explained by reference to the original Northumbrian forms. The excessive conservatism of Grein was shown to be misplaced when applied to such corrupt texts as those of many of the Anglo-Saxon poems. Finally, some interesting details were given of Kemble's treatment of the MS. of the poem of "Saturn." It appears that Kemble's edition is full of wanton omissions and alterations, many of which are entirely erroneous, some of them making nonsense of the correct MS. text.

MATHEMATICAL SOCIETY.

NOV. 9TH.—Prof. H. J. S. Smith, President, in the chair. After the reading of the treasurer's and secretary's reports, the meeting proceeded to the election of the new Council. The following are the names of the gentlemen elected: President, Lord Rayleigh; Vice-Presidents, Messrs. C. W. Merrifield, H. J. S. Smith, and W. Spottiswoode; Treasurer, Mr. S. Roberts; Hon. Secretaries, Messrs. Jenkins and Tucker; other members of the Council, Profs. Cayley, Clifford, Drs. Henrici and Hirst, Messrs. T. Cotterill, J. W. L. Glaisher, R. Harley, A. B. Kempe, and J. J. Walker. Lord Rayleigh on taking the chair briefly acknowledged the honour done him, and called upon Prof. Smith to deliver his valedictory address: the subject was "The Present State and Prospects of Pure Mathematics." Mr. Glaisher communicated a "Note on Certain Identical Differential Relations." The secretary read parts of papers by Mr. Spottiswoode, "On Curves having Four-Point Contact with a Triply Infinite Pencil of Curves;" and by Mr. E. B. Elliott, "On some Classes of Multiple Definite Integrals." Prof. Greenhill was admitted into the Society.

CAMBRIDGE PHILOLOGICAL SOCIETY.

NOVEMBER 9TH.—*Annual Meeting.*—Prof. Cowell in the chair. The following communications were read:—"Notes, Critical and Explanatory, upon Aeschylus S. c. Theb. vv. 216, 405, 584; Plato Apol. Socr. 33 B, and Crito 44 D; 1 Ep. ad Cor. vii. 1 and ix. 1," by Mr. Wratislaw; "On an Inscribed Greek Vase with a Homeric Subject," by Mr. Gardner.

ZOOLOGICAL SOCIETY.

NOVEMBER 7TH.—Prof. Newton, V.P., in the chair.—The Secretary read a Report on the additions to the menagerie made during June, July, August, and September. Letters and communications were read: from Dr. O. Finsch, "On the Supposed Existence of the Wild Camel *Camelus bactrianus*) in Central Asia,"—from Mr. E. P. Ramsay, "On the Habits of some Ceratodi living in the Austrailian Museum, Sydney, and lately received from Queensland,"—by Mr. W. K. Parker, "On the Structure and Development of the Skull in the Sharks and Rays,"—by Lieut.-Col. Beddome, "On a New Species of Indian Snake from Manantawaddy, in the Wynaad Hills, which he proposed to name *Platyplectrurus Hewstoni*,"—by Dr. G. E. Dobson, "On the Bats of the Group Molossi,"—by Dr. A. Günther, "On Some of the Recent Additions to the Collection of Mammalia in the British Museum," amongst the more remarkable of which was a new form of Porcupine, from Borneo, proposed to be called *Trichys lipura;* and a new Marmozet, obtained by Mr. T. K. Salmon, near Medellin, U.S. of Columbia, to which the name *Hapale leucopus* was given. Prof. A. Newton made a correction of some of the statements in Canon Tristram's "Note on the Discovery of the Roebuck in Palestine" (*P.Z.S.*, 1876, p. 421).

ENTOMOLOGICAL SOCIETY.

NOVEMBER 1ST.—Prof. Westwood, President, in the chair.—Mr. F. Smith exhibited some remarkable specimens of thorns from Natal and Brazil, which had been taken possession of by species of Cryptoceridæ for the construction of their nests. Some of the thorns were as much as three inches in length. Prof. Westwood mentioned an instance of the hairs of a larva of *Lasiocampa rubi* having caused considerable irritation of the skin, and that the irritation was complained of by his correspondent for a week afterwards. The Professor exhibited a singular Coleopterous larva from Zanzibar, of a flattened, ovate form, and a steel-blue colour, with two points at the extremity of the body, and with long, clavate antennæ. The head bore some resemblance to that of the Dipterous genus Diopsis. He also exhibited a specimen of the butterfly *Hesperia sylvanus*, received from the Rev. Mr. Higgins, of Liverpool, having the pollinaria, apparently of an Orchid, attached to the base of the tongue. Also an Orchid bulb purchased by Mr. Hewitson with a collection of roots from Ecuador, which was found to contain nine living specimens of Cockroaches, comprising six different species, viz., *Blatta orientalis*, *Americana*, *cinereæ*, *Maderæ*, and two others unknown to him, some being of considerable size. Mr. Dunning read a "Note on Acentropus," in which he remarked on Heer Ritsema's Second Supplement to his Historical Review of the Genus, published in the *Trans-*

actions of the Entomological Society of the Netherlands, in which that author tried to prove that two distinct species existed, of which one (*A. niveus* Oliv. = *A. Garnonsii*, Curt.) has a female with rudimentary wings, and the other (*A. latipennis*, Möschl. = *Zancle Hansoni*, Ste.) has a female with normally developed wings; whereas Mr. Dunning argued that the facts, as stated by Heer Ritsema, did not in any way prove the duality, but were quite consistent with the unity, of the species.

LINNEAN SOCIETY.

November 2nd.—Prof. Allman, President, in the chair.—Mr. Duppa Crotch exhibited a live specimen of the Lemming, from Norway, and explained, by charts, the particulars of two migrations of this guinea-pig-like creature witnessed by himself. A paper was read. by Mr. G. Benthan, V.P., "On the Classification and Terminology of the Monocotyledons." In working out the Flora of Australia he has found it needful and convenient to attempt a rearrangement of the vegetable division in question. Rejecting Lindley and Brogniart's characters and grouping, he rather adopts, but with considerable modifications, E. Fries's four primary divisions, chiefly based upon the structure of the perianth. These—I. Epigynæ, II. Coronariæ, III. Nudifloræ, IV. Glumales—are again subdivided by Mr. Bentham into orders founded on a variety of subsidiary characters. The Alismaceæ (Water Plantains) he makes an order of under the Nudifloræ. It is a very anomalous group combining something, as it were, of I., II., III., as above numbered, though he deems it more strictly links the Naiades with the Hydrocharideæ. From the Irideæ (Irises) to Cyperaceæ (Sedges) are a series of orders whose boundary lines are faint and cross relationships numerous. Palms, notwithstanding their woody stem and shape of leaf, have flower and fruit resembling somewhat that of rushes. The nature and homology of Glumes, as significantly bearing on terms in use, Mr. Bentham revises and enunciates:—1. Homologous organs should be designated by the same name; 2. Non-homologous organs ought to be called by different names. Dr. Francis Day, in a communication "On some Irish Sticklebacks (Gasterostei)," has found such abnormal variations in the presence and absence of ventral fins and spines in the Three-spined and Ten-spined Sticklebacks, that he regards these appendages as an imperfect diagnostic character. M. Sauvage's divisions thereby of the family into sub-genera and seventeen species he opposes. The spinal armature of the Gasterostei he considers has an increment in ratio according to proxmity and access to a maritime habitat. Mr. D. Sharp, "On the Respiratory Function of Carnivorous Water Beetles," from experiments, shows that great inequality of submersion and surface aeration exist among the species. *Pelobius Hermanni*, for instance, remains under water in a ratio of 375 to 1 of air exposure; whereas *Dytiscus marginalis* has the ratio of 12 to 1. The water beetles are more active by night than day. A second paper, by the same author, "New Species of Beetles (Scarabæidæ) from Central America," collected by Mr. Belt, was taken as read. Mr. A. G. Butler made some remarks and exhibited a series of butterflies illustrating a communication by him "On the Genus Euptychia," with a tabular view of all the known species. "Description of Two Lepidopterous Insects from Malacca" was also announced from Mr. Butler. A supplemental notice of Algæ obtained by the Challenger expedition, by Prof. Dickie, was briefly mentioned.

HISTORICAL SOCIETY.

Nov. 9th.—Annual Meeting.—A Genealogical section was constituted, in connection with which will be forthwith issued genealogical memoirs of Sir Walter Scott, including a reprint of his rare tract, "The Memorials of the Haliburtons." Dr. B. W. Richardson, who was elected President of the Council, delivered an address "On the Phenomena of Historical Repetition."

METEOROLOGICAL SOCIETY.

November 15th.—Mr. H. S. Eaton, M.A., President, in the chair.—Dr. W. Marcet, Rev. F. G. P. Pope, Messrs. R. A. Allison, J. Evans, and G. Washington, were elected Fellows.—The following papers were read: "Results of Meteorological Observations made at Rossinière, Canton Vaud, Switzerland, during 1874 and 1875," by Mr. W. Marriott. Rosinière is situated in a valley running north-east and south-west, about three-quarters of a mile broad, the mountains on the north being 3,000 or 4,000 feet above the valley of the Sarine, and those on the south, 1,000 to 3,000 feet. The valley is shut in at either end by a gorge, that on the east being about one mile, and that on the west about two miles distant. The observations were all taken by Col. M. F. Ward. The mean temperature, as deduced from the mean of the maximum and minimum readings, was 43°·4 for 1874, and 43°·5 for 1875. The monthly means ranged from 20°·0 for December, 1874, and 20°·5 for December, 1875, to 64°·9 for July, 1874. The highest temperature in 1874 was 89°, on July 3, and 1875, 85°, on August 18; the lowest in 1874 was—4°, on December 24, and in 1875—7°, on January 1. Owing to the situation of Rossinière, the prevailing winds are those from the north-east and south-west. In the winter months the air is for the most part calm, and it is owing to this absence of wind that the intense cold is not so severely felt as it would otherwise be. The total rainfall for 1874 was 54·282 in., and for 1875, 55·870 in. The months of greatest rainfall are July and November, and those of the least, February and March. Thunderstorms occur frequently from May to August, as many as five being sometimes recorded in one day. The number of thunderstorms observed in 1874 was 45, and in 1875, 43. No thunder was heard, or lightning seen, in the months of December to March. "The Climate of Fiji," by Mr. R. L. Holmes. This paper contains the results of meteorological observations taken at Delanasau, Bay of Islands, north coast of the province of Bua, Fiji, during the five years ending 1875. "Notes on some Remarkable Errors in Thermometers' Record at Sydney Observatory, 1876," by Mr. H. C. Russell.

ASIATIC SOCIETY.

Nov. 20th.—Sir E. Colebrooke, Bart., M.P., President, in the chair. A paper, contributed by Capt. E. Mockler, was read, giving an account of some excavations made by him at Gwâder in Makrân, during the spring of the last year; the results he obtained showing clearly that this portion of Asia must have been occupied at a very early period by a population using flint implements and other pre-historic objects.

ANTHROPOLOGICAL INSTITUTE.

November 14th.—Col. A. Lane Fox, President, in the chair. The President read a paper "On the Black Burgh Tumulus, Dyke-road, Brighton," explored by him in 1872. This tumulus, about two miles from another, opened in 1856, which contained the amber cup, bronze dagger, &c., now in the Brighton Museum, was found to contain towards the centre a layer of charcoal 1ft. 10in. below the surface, and extending to a radius of 20ft. This, on being microscopically examined, was found to be oak charcoal. Portions of ribs of goat or sheep, notched, apparently with a flint saw, were found, a piece of British pottery, and, in the centre of the tumulus, in an oblong grave 8ft. by 12ft., was found a skeleton, in a crouching position, 6ft. below the surface, and crushed flat by the superincumbent earth, the face towards the south-east. These remains Prof. Flower ascribes to a female of about 5ft. 6in.; about 2ft. from the feet lay a fine bronze dagger, 4in. in length, with the rivets for attaching it to its handle. A curious food cup, with peculiar ornamentation on one side, and two small discs of metal, apparently rivet heads, together with a quantity of small flat beads, originally strung together, were found here. These objects belong to the time of the interment; two flint scrapers also were found near the body. The chief peculiarities of this find are the presence of a dagger with a female skeleton, and the curiously ornamented food cup. The President then read a paper "On the Exploration in 1875 of the Ditch and Tumulus in Seaford Camp." In the ditch, at 1ft. below the present surface, were found one or two pieces of mediæval pottery, then Romano-British at about 3ft., and below this chalk rubble, evidently filled in, till the original bottom at 7ft. was found. The tumulus inside the rampart was examined, and a large flint scraper and a piece of British pottery were found at 2ft. Below, at a depth of 3ft. 5in., five flint saws, and more British pottery, were found; also the fragments of a flint hammer, and a polished flint celt, originally 5in. long, but broken into three pieces; one of the edges was chipped to make a new edge. The flint hammer was formed from a sea-worn flint pebble. The flint celt had evidently been fractured three or four times at the place of interment. Scrapers, and fragments of pottery, and a broken but well-shaped barbed arrow-head, were also found. No trace of bone was found. Mr. F. G. H. Price read a paper "On Excavations in the Romano-British Cemetery," at Seaford, Sussex, by himself and Mr. J. E. Price. The author described the cemetery and the cuttings they made in it. The surface soil, extending to a depth of about 3ft., contained large quantities of flint scrapers, flakes, and fragments of pottery. Several urns were met with, at a depth of 3ft. 6in. from the surface, which contained, in addition to the usual calcined bones, thin iron nails, with large heads, flint flakes, and bronze fibulæ.

ON THE FRACTURE OF RAILWAY TIRES.

By Mr. W. W. Beaumont, Assoc. Inst. C.E.

Between the years 1847 and 1874 80 accidents from broken tires, attended by serious results, had been reported upon by the officers of the Board of Trade. The total number of tires fractured was not known, as previous to 1872 the railway companies made no return of such accidents; but, since 1847, tire fractures had resulted in the loss of 74 lives and 236 cases of serious personal injury. So far as the author knows, no satisfactory explanation has been given of the forces productive of fracture of tires of good material and workmanship, and the object of this paper (read at a recent meeting of the Institute of Civil Engineers) is to suggest a cause for their origin. In it some of the theories advanced to account for tire fracture are treated of; such as the strain due to shrinking tires on to wheel bodies, the reduction of the sectional area by rivet or bolt holes, and the alleged reduction of the strength of the tire by low temperatures in winter. These causes are considered to be inadequate to account for—

1st, The fracture of a good tire; 2nd, The fracture of tires in several places simultaneously; 3rd, The fracture of tires through the solid body rather than through bolt or rivet; 4th, Breakages being few in number for a long period, and then occurring frequently; and 5th, Tires, generally of considerable age, running several thousand miles before flying to pieces.

For an explanation of these facts the author appeals to internals differential molecular strains, generated in the material of tires, by extension and compression from their surface inwards, consequent upon their rolling at high velocities under heavy loads, along the hard, smooth, and somewhat rigid permanent way. If a piece of flat stout plate metal was subjected, when cold, to long continued light hammering, or rolling, on one of its surfaces, that surface would become compressed and elongated. The effect of thus altering the relative dimensions of the two surfaces of the originally flat plate would be to make it assume the form of an umbo, with the convexity toward the rolled or hammered surface. In illustration of this, refer to the straightening of coping plates, or other plate castings, which had become bent in cooling, by lightly hammering the concave side and thus elongating that side. Another example is afforded in the curvature produced in tram plates, for instance, those on Westminster Bridge, by the extension and compression of the surface exposed to the rolling under the loaded wheels of vehicles. Similarly, film after film from the surface inwards of the material of a railway tire was compressed, until the thickness molecularly altered induced internal differential strains sufficient to rupture the tire, or so nearly to effect it, that an unusually heavy impulse, or other extraneous force, was alone necessary for such a result. As these strains approached equality throughout the tire, the length, and therefore the number of pieces into which the tire would be broken, would be determined by the limit of stability and the co-efficient of elasticity of the material. Absolute simultaneity of multiple fracture is not a necessary condition of such a result, as the precedence of one fracture would liberate the tire, so that the internal forces would be free to initiate fracture in as many places as might be necessary to expend the excess of the forces tending to rupture, over those of resistance to it. Of the reported fractures of tires, affixed by rivets or screws, nearly one-third were fractured through the full section, and not at a bolt or rivet hole; thus indicating that those tires were either strongest at the reduced section, or that the internal forces tending to produce fracture were greater between than at the rivet or bolt holes. In tires of good material and workmanship fracture would be expected to take place rather between than through such holes; for at these the continuity of the material was broken, so that the tangential compression, produced in the outer portions of the tire by the impeded elongation of the material, was dissipated by an upward flow of the particles round such holes. This upward flow tended to produce a crater-like ridge, which is quickly worn off, so that the tire at these points was relieved of strain, the material that would have exerted it being carried away. Elastic wheels could only be considered as a palliative, for the tire had still to support a load, so that its surface would be subject to compression, although the mischief would not proceed so rapidly as with a nearly rigid wheel. The inertia of impact strain upon a rigid wheel would have to be overcome by the tire before it was relieved by the springs of the vehicle, whereas a good elastic wheel possessed in some degree the character of a spring, and in so far was without any such inertia. However good the material and workmanship of a railway tire, and in whatever manner affixed, it must gradually become unsafe, from other reasons than simple loss of thickness, for whether it was of steel or of iron it was amenable to the production and accumulation of molecular strains. The great durability of American chilled wheels was probably owing to the extreme hardness of their running surfaces, and their consequent resistence to surface compression. Although the ultimate strength of a tire was probably not reduced by the bolt or rivet holes, the preferable method of fastening was unquestionably by continuous clips and grooves on both sides of the tire, so as to prevent the portions of a fractured tire from leaving the wheel. It is to this latter cause, rather than to simple fracture, that many lamentable accidents are to be ascribed.

SAWING MACHINERY AT THE AMERICAN CENTENNIAL EXHIBITION.

THE sawing machinery, says a correspondent of the *Times*, styling himself "A Mechanician," came chiefly from the timber districts of the West, and has a character of its own. While the machinery of the Eastern side of America may be said to have refinement for its most prominent characteristic, that of the West is distinguished by daring boldness. There were nearly twenty of these mills in line or adjoining—all earnest competitors, and each provided with from twenty to forty horse power, concentrated on a single saw. The limit of velocity being the tenacity of iron to resist centrifugal force, in one instance the driving pulley was thrown out into space, some of the pieces going through the roof like a cannon ball. In details the mechanism of these mills differ in each, but the general features of all are nearly alike. The log is fixed on the side of a long carriage that travels upon a railway, and is automatic in its several movements. The carriage runs with the log on to a circular saw, at a pace of from four to six miles an hour, and returns at triple speed. The most daring saw miller at the Centennial was E. P. Ellis, from Milwaukie. He required a stream of water to keep down the temperature of his saw. The sawing of this mill was a sight not to be easily forgotten. The saw-mill most matured in all its details belonged to Mr. Stern, who is the oldest and most noted saw-mill maker in the United States; but this mill did not work, the reason given being a deficiency of steam power. Be that as it may, the machinery of this firm was superb. The mill of another firm, E. W. Ross and Co., seemed to be the favourite. It was almost equal to the best in rapid execution, and excelled in the economy of wood. Besides, it had many original points in the automatic motions, and did every movement with marvellous gentleness. As a piece of working mechanism it was of high rank, and suggested the idea that the designer had studied the self-acting mule of Richard Roberts. A powerful band saw was shown by C. Meiners, probably the largest in the world. The band is 8in. in width, and is driven at a velocity of 60 miles an hour. It might be supposed that danger was involved, but it was reported that in practical working an accident was of rare occurrence. A fine display of circular saws of all sizes was made by a number of firms, all of excellent quality so far as the quality may be judged by mere inspection. The chief point to mention about them is the manner of treatment after the hardening operation. When large saws are made red hot, and then suddenly cooled, they are frequently bent and buckled. This is usually rectified by a skilful stretching of the rigid spots by hammer and anvil, which liberates the structure until at length it is a flat surface, and runs true as a saw. In the new American system no hammering is resorted to. The buckled saw is compressed in a mould between two flat surfaces, the operation being performed in an oven made on purpose, which is carefully heated up to the proper temperature required to give the saw temper. The oven is allowed to cool down with equal care, and when taken out of the mould the saw is found tempered without being buckled. The Exhibition was rich in devices for sharpening the teeth of saws. The file is entirely discarded, the emery or corundum wheel being substituted. In most instances the truth of the saw is determined by transfer from a template, one machine for this purpose being entirely automatic; when it has gone round the entire circumference it stops of itself.

In connexion with the lumber trade exhibition, an original contrivance for controlling great rafts of timber in the large rivers of the West was shown by Mr. A. Kempt, Wisconsin, which elicited admiration for its simplicity and efficiency. Hitherto, rafts have been guided by a number of men with oars, whose united efforts are frequently unavailing. In this new arrangement a series of rudders is temporarily hinged along both sides of the raft; those on either side are simultaneously manipulated by a single chain carried to the rear, where one man by means of a windlass can draw them out or let them in. When out, the rudders are acted upon by the current, which thus becomes the agent to urge the raft transversely to either side as may be necessary.

This Exhibition is remarkable for the number of efficient machines for working all sorts of stone. The chief feature of almost all of them is the employment of the diamond as the cutting agent. Former Exhibitions have been renowned for their display of diamonds as articles of ornament. At Philadelphia diamonds are in equal profusion; but they are used for the teeth of saws and drills to fashion stone to useful purposes. In regard to rock-drilling appliances, the greater number are similar to those employed in Great Britain. The stone-sawing machinery, however, is in advance of anything previously attempted, and most probably will form a new point of departure. The several articles exhibited divide themselves into two classes —for vertical sawing with frame and for circular sawing, the latter predominating. Most varied were the mechanical arrangements, but in three main points all unite. Every saw tooth is tipped with a diamond; an enormous concentration of power and velocity is employed; and, lastly, a deluge of water runs upon the point of action, to keep down the temperature and to subdue the shower of sparks. Much refined ingenuity is displayed in some of the methods devised for setting the diamonds, so as to secure them in such a thin body, and at the same time to give them a good rear support quite out to the cutting surface of the tip. The saws are about 6ft. in diameter, and the diamonds are of the dull Brazilian variety, and seem to do their work most admirably. The firm of Branch, Crooks, and Co. made a great impression by the completeness of all their arrangements, and the steady-going way in which their machinery sliced great masses of stone into slabs of any thickness.

In reckoning up the significance of this grand aggregate of machinery and congratulating ourselves on its results, as showing how the toil of man can be mitigated while the wants of civilized life are abundantly provided for, it is impossible not to feel that an important change is approaching. A century ago no conditions existed which could have enabled Adam Smith to anticipate a time when the producing power of automatic machines would exceed the requirements of the human race. That state of things is rapidly approaching, and it is for the Philosopher and Political Economist to consider carefully beforehand the impending revolution, so that it may all work for good to the Family of Mankind.

THE SCIENTIFIC INSTRUMENTS AT SOUTH KENSINGTON.

THE provisional managers of the guarantee fund for purchasing scientific apparatus now exhibiting at South Kensington have received from the Duke of Devonshire an intimation of his willingness to subscribe £5,000 to the fund, on condition that four other persons will do the same. There are in addition already five promises of £1,000 each from Mr. W. Spottiswoode, Mr. Warren de la Rue, Sir John Lubbock, Bart., M.P., Messrs. Siemens Brothers, and Sir Joseph Whitworth, Bart. There are also many promises of £500, £250, £200, £150, &c. The object of the fund is to secure by purchase those instruments now at South Kensington, "which it may be to the advantage of science to exhibit permanently, but which, failing such purchase, would be returned to the exhibitors." No decision on the part of the Government has yet been made known as to what will be done regarding the establishment of a permanent museum. Her Majesty's Commissioners for the Exhibition of 1851 have agreed to erect a museum at a cost not exceeding £100,000, and to place it at the disposal of Her Majesty's Government. Whether the offer will be accepted or not, it will take time to carry it into execution, and it has been felt by those interested in the undertaking that the existing collection should kept intact as far as possible.

BRITISH ASSOCIATION, 1876.

(*Conclusion of Report.*)

MECHANICAL SCIENCE.—A very exhaustive paper was read by Mr. F. J. Rowan, "On Boiler Incrustation and Corrosion," in which the author had made a very complete *résumé* of the subject. The proceedings were ended by a paper "On the Direct Motion of Steam Vessels," by Mr. R. Mansel.

The proceedings of Tuesday were commenced by reading an interim Report of the Committee on "British Measures," which states that the Committee had done nothing, but hoped to do something if reappointed. A paper, by Mr. A. B. Brown, descriptive of an engine for starting and reversing large engines, was brought before the Section. Prof. A. B. W. Kennedy explained Reuleaux's theory of mechanism. Prof. Reuleaux is the director of the Gewerbe-Akademie in Berlin, and has recently published in his "Theoretische Kinematik" a method of studying mechanism which is now extensively used in the polytechnic schools, not only of Germany, but also of Russia and Italy. Among the characteristics of this method, Prof. Kennedy mentioned the use of the curves called "centroids," the systematic investigation into the restraint of moving bodies, the treatment of fluids in mechanism by a method absolutely analogous to that of rigid bodies, and the rotation which he has devised for mechanisms. Prof. Kennedy also illustrated at some length by diagrams, the nature of what Reuleaux calls the kinematic analysis of mechanism, pointing out its usefulness in the investigation of the relations between various mechanical combinations.

Mr. Mortimer Evans explained his "safety lock for facing points." This was followed by an interesting and suggestive paper, by Capt. Douglas Galton, under the title of "Notes on Railways on the Three-foot Gauge in the United States"

The author said that in recent years a considerable development of this class of lines had taken place. The railway in the United States is the pioneer road; it must be made as cheaply as possible at first, and improved as population increases. He stated that the cost of two narrow-guage lines was given at £1,900 and £2,300 per mile, and that another, which was, however, only ten miles long, cost £3,500 per mile. He compared the weight of the engines and cars on the broad guage with those used on the narrow gauge, and maintained that on the narrow gauge the hanging load bore a greater proportion to the dead weight than on the broad or standard gauge of 4 feet 8½ inches. On the narrow gauge the cars had been constructed so as to be as light as possible, but a desire was gaining ground to increase the weight of the car. To make the cars heavier and broader would, he believed, render them unstable; but if these heavy cars of eight feet wide were run sparingly, he thought economy could still be claimed for the three-feet gauge on the ground of diminished width of railway. It was useful where the traffic was light, but where the traffic was heavy and regular he gave as his opinion that it would require to be converted to the standard gauge, and that a standard gauge line would answer all purposes if made with a light rolling stock.

Mr. J. Steel described his continuous brake on the compressed air system, and discussed the brake problem generally. The form of blocks for testing cement, and how far the strength of cement was affected by delay between mixing and placing it *in situ*, was practically treated in a paper by Mr. G. F. Deacon. Major Beaumont described how subaqueous rocks are removed by the use of the diamond rock borer. An ingenious form of fixed lamp for workshops, mines, and in railway stations, and are suitable for burning oils, and the heaviest hydrocarbons, was described by Mr. R. Lavender. By means of a jet of steam a rapid draught is created, which, guided through the centre of the wick, and on the sides, supplies air in suitable quantities for the complete combustion of the oil, and in producing a cheap and brilliant light. Mr. Jas. Nasmyth sent for inspection of the Committee a drawing of a pendulous safety valve for steam-boilers, stating that a forty years' experience of it in use confirmed the perfect efficacy of its action. The application of a system of spring heads to piers was explained by Mr. Mortimer Evans, and a paper explanatory of a method for flanging iron and steel plates, by Mr. A. B. Brown, brought the day's proceedings to a close.

In order to complete the business of the section, a short sitting was held on Wednesday morning, when Sir William Thomson brought before the meeting an extension of that system of signalling which he had explained at a former meeting of the Association. It will be remembered that he suggested the adoption, both for lighthouse and naval purposes, of a system of flashing lights, or the raising and lowering flags, with long and short intervals, on the principle of the Morse telegraph, where the alphabet is formed by a combination of dots and dashes. Sir William Thomson's present suggestion is to adapt the system to sound, and express the signals by long and short sounds, *i.e.*, of notes of slightly different pitch,—the grave representing the long signal, or dash, the acute the short signal, or dot. Two steam whistles, of different notes, was perfectly efficient for the purpose. Mr. Harper described some ingenious railway-safety appliances, and the business of the section was concluded by the reading of the following papers: "On a Hand Machine for Shaping and Finishing Metal Surfaces," by J. W. Beynon; "Apparatus for Mine and Warehouse Hoists," by Thomas Dobson; "On an improved Steam Ferry," by William Simons; "On Drainage Outlets through Slob-lands," by A. Crum-Ewing; "Recent Attempts at Patent Legislation," by St. J. V. Day; and "Communication between Passengers and Guards in Railway Trains," by W. Stroudley.

PURIFYING IRON AND MAKING STEEL.—John L. Randall, Albany, N.Y., assignor to himself and Stephen Munson, same place.—This consists in treating molten cast iron, while in a receiver, with pulverized titanic or equivalent iron ore, potassic ferrocyanide, and potassic nitrate. The process allows of using old as well as new material, utilizing refuse metal the vitality of which has been nearly destroyed, restoring it to a high standard of excellence. By the said combination of materials also a superior and uniform grade of metal, suitable for extra fine castings, is produced, which may serve as a substitute for steel.

SEED PLANTER.—William F. Finney, East Castle Rock, Minn.—This machine, for planting corn, beans, sorghum, broom corn, and other seeds, is so constructed that it may be readily arranged to plant the seeds at any desired depth, that the ploughs may be easily raised from the ground, and so that the operating mechanism may be readily thrown into and out of gear with the driving wheel.

COMBINATION AGRICULTURAL TOOL.—Maynard Reynolds, Manchester Depot, Vt.—This is an improved shank, so constructed as to receive and securely hold a hoe, a weeding hoe, a potato hook, and a rake, in such a way that the said tools may be attached and detached by simply tightening and loosening a screw. A hoe, a narrow or weeding hoe, a potato hook, and a rake are designed to be made and sold with the handle. By this construction, by simply loosening a hand screw, either of the tools can be detached, and another inserted in its place, so that the farmer or gardener need buy but one handle or shank for a set of tools.

APPLICATIONS FOR LETTERS PATENT.

On June 24th.—(*Continued from page* 174.)—D. C. Lowber. Bale ties.—G. I. J. Wells. Manufacture of soda and potash.—M. Zingler. Preparation of gold and silver paints, bronze paints, and other paints or colours or inks used in painting and printing.—C. Denham. Machinery or apparatus for cutting leather.—E. E. Knox, C.E. Knife or opener for preserved food tins.

On June 26th.—2624 to 2637.—N. H. Holst. Combined interlocking points and signal apparatus for railways.—H. J. Haddan, C.E. Pads for dampening the leaves of copying and other books and for other purposes (com.) (Complete specification.—B. J. B. Mills. Folding stools or seats and tables (com.)—E. D. A. Marriner and C. Hoyle. Machinery for washing and drying wool or other fibrous substances.—W. Whiteley. Machinery for roving and spinning woollen or other fibrous substances.—E. Collins. Infants' feeding bottles.—C. T. Kingzett and M. Zingler. Preparation of blood-albumen, and the application of the same for purposes of dyeing and printing on textile and other fabrics with colours also applicable to sizing and enamelling wood, glass, and metals.—W. Morgan-Brown. Wire-drawing and the apparatus employed for that purpose (com.)—R. J. Hutchings. Machinery or apparatus for manufacturing tin, terne, and metal plates.—D. Greig and M. Eyth. Air condensors for steam engines.—H. L. McAvoy. Stoves and furnaces for heating and ventilating buildings.—A. V. Newton. Liquid meters (com.)—H. E. Newton, C.E. Suspending hammocks, cots, litters, invalid chairs, or other analogous articles for supporting or resting the body on board ship (com.)—W. R. Lake. Couplings or connections for pipes, faucets, and the like (com.)

On June 27th.—2638 to 2657.—J. K. Collett. Paving for roads and footways.—J. Biggin. Instrument or apparatus for dressing and skinning animals, and for other purposes.—E. P. Alexander. Lasting and bending the uppers of boots and shoes and other coverings for the feet, also stretching leather and skins, and the machinery or apparatus employed therein (com.)—J. O. Hanctin. Apparatus for crushing, grinding, and mixing various substances.—J. Warwick. Shuttles for sewing machines.—J. Elce. Machinery for spinning and doubling.—P. Jensen. Frames for umbrellas and parasols (com.)—R. T. Tait. Manufacture of tobacco from stalks or ribs, and the machinery employed therefor. (Complete specification.)—W. McGee. Semi-automatic spooling or thread winding machines.—O. M. Draper. Chain swivels and process of manufacturing the same (partly com.) (Complete specification.)—G. Benson. Veining, hem-stitching, and embroidering machinery.—J. Likeman and H. J. Lawson. Construction of bicycles.—E. G. Guérin. Dipping cup for inkstands and other recipients.—E. T. Hughes. Treating wood and vegetable fibre in general to preserve the same from decay, and apparatus employed therein (com.)—D. Lévy. Straps or belts for driving machinery, or for other purposes.—H. Batchelor and T. C. Batchelor. Making working drawings or diagrams with moving parts to illustrate the working of machine and other actions or movements.—A. M. Clark. Manufacture of railway wheels (com.) (Complete specification.)—G. Davies. Dies or moulds and apparatus used in the manufacture of roofing, flooring, and other tiles, paving bricks, and quarries.

On June 28th.—2658 to 2674.—W. L. Wise. Telescopes whereby they are rendered available for measuring distances (com.)—J. Ketley and G. Moss. Shuttle-lockstitch sewing-machines, and shuttles for the same.—C. Loader. Machines for elevating and stacking hay or corn or other agricultural produce. — R. Dixon. Manufacture, dressing, dyeing, and colouring of furs, skins, and animal and vegetable fibres of all kinds. —J. A. A. C. de Lavalette. Hydraulical motor having centrifugal power.—R. Wilson. Hydraulic presses and apparatus connected therewith.—J. Tibbs. Mill furnaces used in the manufacture of iron.—M. H. Kernaul. Couplings for driving shafts, which are also applicable for other purposes.—M. J. Roberts. Apparatus for driving sewing machines, lathes, or other machinery.—R. Whitaker. Apparatus for excavating earth and other substances, being also applicable for loading the same into waggons or other receptacles.—H. Killiches. Dynamometers. — W. R. Lake. Process and machinery for reducing cereals or other substances to flour or powder (com.) (Complete specification.)—W. R. Lake. Throats of sewings machines (com.)—E. Demonchaux. Embroidering machinery for producing ornamental figures or devices of handkerchiefs and other textile fabrics.—W. R. Lake. Lamps and lamp burners (com.)—E. P. H. Vaughan. Apparatus for binding grain (com.)—R. Brown. Candlesticks.

On June 29th.—2675 to 2689.—J. Farmer. Machinery for delivering and counting printed sheets of paper.—D. J. McLauchlan. Machines and apparatus for the printing and cutting lozenges (com.) (Complete specification.)—J. Ireland, jun. Reduction of oxide ores of iron and other metals (com.)—R. L. Johnson. Door-knocker.—C. E. Hoevel. Construction of wheel or roller skates.—A. M. Clark. Waterproofing compound for skins and leather (com.)—A. L. Fyfe. Ladies' girdle fasteners. —J. Somerville. Construction and special application of valves.—T. Johnston. Golf clubs.—J. H. Johnson. Cocks (com.)—J. Duncan and B. E. R. Newlands. Treatment and purification of sugar and saccharine matters and the apparatus employed therein.—J. Harresceugh. Lid for excreta receptacles to facilitate the removal of the same.—G. W. von Nawrocki. Hardening steel plates and apparatus therefor, and safes constructed with such plates (com.)—J. Gwynne. Excavators, applicable also for other purposes.—G. W. von Nawrocki. Manufacture of armour plates (com.)

On June 30th.—2690 to 2702.—J. Ducan, J. A. R. Newlands, and B. E. R. Newlands. Manufacture of sulphate of alumina.—C. Anderson. Means or apparatus for connecting and disconnecting gas, water, or other pipes.—W. Souter and J. Entwistle. Machinery for dressing and preparing silk waste and tow.—St. G. L. Fox. Railway rolling stock and permanent way for the same.—T. H. Gray. Manufacture of starch and apparatus connected therewith. —P. W. Davis. Raising sunken ships, vessels, and other commodities. — W. O'Hanlon. Counterpanes and quilts and the manner of weaving the same.—P. Adie. Astronomical and surveying instruments.—J. J. Christie. Machinery for rolling iron and steel and other metals and metallic alloys.—G. Vaile. Apparatus for lubricating spindles, shafts, and other surfaces subject to friction, to be called "the paragon lubricator."—L. L. Barber. Cutting attachments for sewing machines. (Complete specification.)—T. Hyatt. Buildings and building constructions, and ornamental and useful building materials and appliances, and the means, modes, processes, and machinery for manufacturing and preparing the said materials as merchantable articles, and their use and application to buildings and building contructions, including walking surfaces and carriage or roadways.—A. M. Clark. Machinery for screw threading rods and bolts and for other purposes (com.)

On July 1st.—2703 to 2724.—H. J. Hadder. Signals and signalling (com.)—G. W. von Nawrocki. Uniting or combining iron and steel together, and the apparatus employed therein (com.)—W. Spence. Carding machines (com.)—W. Galloway. Miners' safety lamps, and applicable to other lamps.—J. Duncan, J. A. R. Newlands, and B. E. R. Newlands. Sulphate of alumina.—J. Monteith. Rotary engines.—A. Cunningham. Measuring tapes, and manufacturing the same.—A. Cunningham Manufacture of waterproof garments.—J. B. Fenby. Easels, and appliances for facilitating the practice of out of door painting.—A. G. Henderson. Gas-meters.—W. E. Fisher. Syringes, hydrants, garden pumps, and other like implements.—T. Rule. Apparatus for stoppering bottles for containing gaseous and aërated liquids.—J. Gammon and W. Clarke. Roller skates.—J. E. Outridge. Construction and arrangement of steam and similar power engines, applicable also for pumps.—C. J. Ball. Apparatus for ironing and finishing linen and other fabrics (com.)—J. Foster. Apparatus to be employed in connection with waterclosets, sinks, and other like communications for ventilating sewerage receptacles, and excluding exhalations therefrom.—T. R. Jordon. Roller skates.—J. Fournier. Bicyles.—C. Mace and J. Brewster. Apparatus for consuming smoke and promoting combustion in the furnaces of steam boilers.—T. Morgan. Fastening the soles of boots and shoes, and uniting pieces of leather, cloth, and other analagous articles (com.)—W. Wilson.— Mowing and reaping machines.—H. Wadsworth.—Applicable to the sole and heels of boots shoes, and clogs, for rendering the same more durable.

On July 3rd.—2725 to 2733.—P. Protheroe. Apparatus for establishing electric telegraphic communication with lightships, partly applicable as moorings for other purposes.—J. Imray. Support for persons sitting, particularly applicable in railway travelling (com.)—G. D. Hughes. Apparatus for consuming smoke and economizing fuel in steam boiler and other furnaces.—W. C. S. Clark. Tell-tale clocks.—A. Chapman and J. Watson. Apparatus to be employed in pressing cotton or other materials.—T. A. Swinburne. Anchors.—W. R. Lake. Harvesting machines (com.)—W. Levesley and W. Marshall. Manufacture of metal handles and the means of fixing the same to knives, forks, and other similar articles of cutlery.—B. D. Healey. Apparatus for preparing asphalte.

On July 4th. — 2734 to 2744.—W. R. Lake. Paper-cutting machinery (com.)—W. R. Lake. Apparatus for lowering ships' boats (com.)—W. R. Lake. Furnaces for roasting ores (com.)—J. Calderwood. Utilising sulphuric acid tar.—J. Hunt. Manufacture of envelopes.—A. M. Clark. Coffee-pulping machine (com.)—C. G. Hill. Pleating machines.—S. H. Johnson, F.C.S. Filter presses.—S. J. Mackie, C. A. Faure, and G. Trench. Manufacture of explosives.—Capt. W. M. G. Turquand. Machinery for shearing or clipping sheep and other animals.—W. L. Wise. Roller skate (com.)

On July 5th.—2745 to 2757.—G. H. Wildes, and W. C. A. Rœttger. Coal shoots and weighing machines, the two being in combination.—J. Sax. —Appartus or gauge for showing by electricity the depth and quantity of water in a tank, cistern, or other receptacle of water, and to give alarm if the water should be reduced below a certatn depth or attain a higher level than required.—F. T. Bond. Filtering and purifying water and other liquids, and the apparatus employed therein. — J. Morton. Preparing woven fabrics and yarns of cotton or other vegetable fibres for being dyed or printed.—A. Squire. Applying a break and propeller to tram cars and all rolling stock. — F. Faucher. Electric brake for subduing and arresting vicious or runaway horses instantaneously.—J. G. Wilson. Self-acting mechanism for recording the performances of engines, railway carriages, and other machinery or apparatus in motion com.)—W. R. Lake. Construction of driving chains for machinery (com.)—R. R. Buck, F. Pattinson, and J. Pattinson. Preparation of cotton for use as an absorbent.—R. MacA. Clark. Avertising.—J. H. Johnson. Balances or apparatus for ascertaining and indicating weight (com.)—G. Low. Starting gear and governors of steam engines. — W. Clark. Apparatus for making tea, coffee, and other extracts (com.)

On July 6th.—2758 to 2764.—J. Lewtas. Apparatus for lighting, heating, and cooking purposes.—J. Rubery. Wire for electric telegraphs, and for other similar uses.—J. G. Hammond, and T. T. Lecher. Screw stocks.—W. W. Weatherburn and R. Weatherburn. Means or apparatus for extracting tubes and ferrules from locomotives and other tubular boilers, and also from tubular surface condensers. — O. Systermans. Apparatus for preventing guards from falling off railway carriages.—T. F. Firth. Manufacture of carpets.—W. F. Nast. Treatment of stable manure and the manufacture of paper.

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On July 8th.—2781 to 2801.—J. Carpenter and J. Sabell. Tandem dog cart.—G. Beadle. Roller skates.—J. Whiteford. Shoeing horses and other like footed animals.—R. Henry. Machine for cutting screws and spiral mouldings.—J. Bardsley. Construction of flooring cramps.—J. Coulson. Traction engines. W. Bowker. Screwing, tube cutting, and nut tapping machines.—W. B. Haigh. Bench sawing machinery worked by hand or power.—T. Benstead. Reaping machines.—E. D. Barker. Railway break apparatus, partly applicable as a steam pump.—D. Greig. Locomotive and tramway engines.—J. E. Remfry. Process of condensation of steam.—E. H. C. Monckton. Preparation of medicines, and apparatus for effecting the same.—D. Longworth. Pneumtaic and other hammers and stamps actuated by rotating shafts.—W. R. Lake. Apparatus to be attached to a reaping machine for receiving, compressing, and delivering cut grain (com).—J. Judge. Signalling on railways, and apparatus used in connection therewith.—A. M. Clark. Keyless repeating watches (com).—J. H. Johnson. Locks or fastenings for bags and similar receptacles (com.)—E. J. Coleman and F. J. Bird. Spring "traveller" (com.)—E. J. Coleman and F. J. Bird. Mechanical arrangements for hooks or couplings (com.)—E. J. Coleman and F. J. Bird. Reaping and sowing machines (com.)

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